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# ANNALS OF SURGERY

MONTHLY REVIEW OF SURGICAL SCIENCE AND PRACTICE

EDITED BY  
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OF NEW YORK.

WITH THE COLLABORATION OF

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PHILADELPHIA  
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He now weighs 200 pounds and his bowels move normally. The tumor involved almost all of the ascending colon, but its thickest point was at the cæcum, and it probably began here.

*Pathological Report* (by Dr. H. E. Robertson, of the University of Minnesota).—Gross specimen consists of cæcum with portions of ileum and ascending colon. In its preserved state the ileum portion measures 25 cm. in length. At the ileocæcal junction is an irregularly lobulated tumor mass, sharply defined on either side and occupying the proximal 6 cm. of the cæcum and ascending colon. A portion of the ascending colon, 6 cm. in length and apparently normal, projects beyond the confines of the tumor.

The walls of the bowel are infiltrated by tumor, reaching a thickness of 1.5 cm. Masses of tumor tissue also project into the lumen of the bowel, almost totally occluding it. In fact, it was found that water poured into the cæcum could not without great difficulty be forced through the tumor area.

The tumor sections with the resistance of fibrous tissue and is very firm. It is everywhere covered by intact mucosa, there being no evidence of ulceration or necrosis. Its cut surface has a grayish-white, glistening appearance. A few firm, enlarged lymph nodes are present in the neighboring mesentery and mesocolon. The appendix measures about 8 cm. in length and is apparently normal.

Microscopically, the tumor is composed of a very cellular connective tissue stroma in which are varying sized groups of strands and bundles of fibrils with many rounded and oval nuclei of varying size. Thin-walled capillaries are abundant. The tumor tissue invades the submucosa and lies immediately adjacent to the mucous membrane. There are a few microscopic areas of necrosis. In some portions connective tissue fibrillæ are almost entirely absent and large numbers of rounded nuclei with irregular masses of chromatin are present. Alongside of some of these cells tiny fibrillæ may be distinguished by special stains. Mitotic figures are fairly common. Numerous eosinophiles and lymphocytes infiltrate the tissue spaces.

Miscroscopic examination of one of the adjacent swollen lymph nodes shows the node invaded by tissue resembling in every respect that found in the parent tumor.

*Diagnosis*.—Round-cell sarcoma of cæcum and ascending colon with metastasis to neighboring lymph node.

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mesentery. From this primitive mesentery all the other mesenteries, omenta and peritoneal folds of the adult are derived by further development, displacement and adhesion, with the exception of the anterior mesogastrium. The anterior or ventral mesogastrium is the remnant of the mesothelial layers, which extended between the ventral abdominal wall and the ventral border of the intestine, just after the splanchnopleure and the somatopleure have closed to form the alimentary tube and the body cavity. This primitive partition is lost below the stomach.

The intestine in the very earliest stage follows the body curve, later a loop is seen projecting toward the umbilicus where, by means of the vitello-intestinal duct, it communicates with the yolk-sac. We distinguish a descending limb and an ascending limb.

The cæcum bud appears about the sixth week. It shows an unequal rate of growth. The terminal piece not keeping pace with the proximal portion forms the appendix. The proximal portion is developed into the cæcum proper. Owing to its rapid growth the ascending limb of the loop, which forms the major portion of the small intestine, is thrown into folds. This very rapid growth of the small intestine forces the slow growing large intestine into the line of least resistance, *i.e.*, toward the median line and the ventral abdominal wall, forcing it gradually upward toward the cephalic end of the abdominal cavity. This occurs about the end of the third month. At the fourth month the cæcum moves to the right, touches the caudal surface of the liver ventrad of the duodenum. The rapid growth of the liver during the placental stage of its circulation, forces the cæcum caudad, past the right kidney to its adult position in the right iliac fossa.

This progression of the cæcum and ascending colon from below upward, from left to right, and finally downward, is accomplished by the twisting, of all the gut and mesentery embraced in the umbilical loop, on its duodenocolic isthmus, or on an axis running from the umbilicus to the superior



III. *Intrapericardial ligation of the main trunk of the left and right pulmonary artery (experimental).*

In dogs it is a comparatively easy matter, after having entered the pericardium, through a left intercostal incision in the fourth space between the left phrenic plexus and the left pneumogastric nerve, to separate the left portion of the pericardium, after a very superficial incision of its turning fold, for about one centimetre from the left pulmonary artery, and then surround the vessel with a ligature. (Not infrequently the left pulmonary artery in dogs divides a few millimetres outside of the pericardium and can then of course be tied there to advantage.) Closing the artery suddenly has no influence on the heart's action and respiration, as proven by many experiments. If the ligature drawn around the vessel has not been tied, but made use of for gentle traction, the right pulmonary artery can be best surrounded with a thread below the left on its course downward and backward before it reaches the posterior aspect of the ascending aorta. The same can be accomplished from above the left pulmonary branch by preparing off the pericardium upward; but this manœuvre is dangerous, in view of the missing sheath of the vessels, and their great thinness (hemorrhage). The advance from below, therefore, has appeared safer to us. The first and most important rule for this work is, after the pericardial fold has been nipped, to proceed absolutely bluntly, with a curved forceps or scissors, slowly and gently. Only in this way can a sudden severe hemorrhage be avoided.

Work on human cadavers, done at the morgue, and made possible through the courtesy of Dr. S. W. Schultze, of the Board of Health, has shown us that the left pulmonary artery, with Trendelenburg's incision, is as thoroughly accessible in man as in animals, at least in the frozen cadaver, although the field of operation is pretty low if aorta and pulmonary artery have not been lifted up with a rubber tube in the transverse sinus of the pericardium (see above, Trendelenburg's operation). But the right main branch makes such a sweeping curve downward and backward that it seems

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## ABSTRACTS OF REPORTED OPERATIONS FOR SARCOMA OF CHEST WALL—Cont'd.

Name and Date.	Operation.	Method contra Pneumo-thorax.	Shock.	Result.
Rehn (Archiv. klin. Chir., 1906, 81, p. 362).	3. Removal of a sarcoma of the size of the fist with the 2d and 3d ribs on the right.	Lung drawn out and sutured to opening in chest.	None.....	Recovery. No recurrence in a year.
Roberts, W. O. (Louisville Jour. of Med. and Surg. Jan. 1906).	Removal of a tumor of the chest wall with attached rib.			
Lockwood, C.B. (Am. Jour., Sept., 1907).	1. Carcinoma recurrent after breast carcinoma. 2. Spindle-celled sarcoma in girl of 17. Two portions of 5th, 6th, 7th, and 8th cartilages were removed. Diaphragm was opened, and apex of pericardium removed. Some shock when pericardium was opened. Portion of lower lobe of left lung removed. Hemorrhage from lung stopped by cautery.	Nothing done to prevent pneumo-thorax.	Very severe...	Recovered and was well 6 months afterwards.
Hoffman (Beiträge, z. klin. Chir., 1908, p. 182). Operation by Kuttner.	Removal of sarcoma of 5th, 6th, 7th, and 8th ribs, with spontaneous fracture of the 5th rib, from an 18 year old girl.	Sauerbruch cabinet.	None.....	Recovery.
Molimard (Faculté de Med. et Phar. de Lyon, Tome, 9, 1908). Operator, Poncet.	M. 18, Sarcoma of 7th, 8th, and 9th ribs. Diaphragm injured and closed by suture.	No apparatus..	Not stated....	Recovery.
Porter (Boston Med. and Surg. Jour., Dec. 24, 1908).	Enchondroma of 6th, 7th, 8th, and 9th ribs; removed with injury to and suture of diaphragm. Lung sutured to intercostal muscles at close to prevent retraction.	Dr. F. T. Murphy's positive pressure box.	None on opening pleura.	Death, pneumonia, 14th day.
Hoffman (Beiträge z. klin. Chir., 1908, p. 182). Operation by Kuttner.	Resection of two ribs for recurrent carcinoma.	Sauerbruch cabinet.	None.....	Recovery.
Menistrina, J. F. (Med. Fortnightly, St. Louis, 1909).	M. 55. 6th, 7th, 8th, and 9th ribs removed for sarcoma.	Pleural cavity opened slowly and packed off with gauze.	Slight.....	Recovery.
Huguier and Rigolot-Simonnot, Paris, 1910.	M. 52. Chondroma of chest wall, involving 7th, and 8th ribs which were removed with it. Resection of a portion of the diaphragm.	Pleura opened slowly. Lung sutured to ribs.	None.....	Recovery. Chest had to be tapped twice to remove blood.
Pier (Deutsche med. Woch., 1911, No. 24).	M. 15. Removal of carcinoma involving 3 ribs, and resection of a portion of diaphragm.	Brauer's positive pressure cabinet.	Severe, but checked when opening in diaphragm was sutured.	Recovery.

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which the employment of jejunostomy as a temporary measure is wise. Jejunostomy under these conditions may make a subsequent operation possible, when if a radical operation were attempted without the preliminary jejunostomy the patient might die.

I have collected all cases of sarcoma of the stomach in readily accessible literature which have been operated upon. In a study of these cases of sarcoma of the stomach certain facts are of interest. The tumor starts usually from the submucosa or muscularis. The mucosa is involved in the disease rather late. The disease is one of young and middle adult life. The posterior wall of the stomach and the greater curvature are most often involved. The orifices of the stomach, cardia, and pylorus are rarely involved. Various cell types of sarcoma are found. Spindle-cell sarcoma is quite common. The tumor may be small or reach even twelve pounds in weight. The growth is rarely secondary. It is ordinarily primary in the stomach. The growth extends either outward into the free abdominal cavity or into the lumen of the stomach as in the case here recorded. There is an absence of cachexia in far advanced cases of this disease; quite a different picture from that of carcinoma.

In the absence of metastases a radical operation appears to hold out even better chances of cure than in carcinoma.

I have appended the bibliography that has seemed to be pertinent to the subject under discussion.

CASE.—J. H. P., a Swede, aged twenty-nine years, occupation a composition floor-layer, entered the Massachusetts General Hospital on May 1, 1912. He was a private patient of Dr. W. W. Harvey, of Roxbury. His family history was excellent, his father, seven brothers, and one sister being alive and well. His mother was living but had some stomach trouble. The patient had always been strong and well excepting for an attack of typhoid fever "long ago." He chewed 35 cents' worth of tobacco a week. There was no history of venereal disease.

For about two years previous to the patient's entrance to the Hospital he had been troubled with frequent attacks of "in-

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DR. WILLIAM B. COLEY, of New York, drew attention to the fact that although sporadic cures were sometimes noted as of spontaneous occurrence, which rather proved them not to be of malignant nature, he had always had his specimens examined not by one but by several pathologists in order to reach as correct a diagnosis as possible, and that even with such convincing proof of the malignant nature of the cases, he had been able to report various cases as cured by the use of the mixed toxins of erysipelas and bacillus prodigiosus.

#### SARCOMA OF THE CHEST WALL.

DR. FRED B. LUND, of Boston, read a paper with the above title, for which see page 206.

#### CARCINOMA OF THE THYROID WITH INVOLVEMENT OF LUNGS THROUGH THE BLOOD-VESSELS.

DR. FRANCIS J. SHEPHERD, of Montreal, read a paper with the above title, for which see page 109.

DR. CHARLES H. MAYO, of Rochester, Minn., emphasized the accepted fact that the younger people are affected with malignancy the more rapidly it is disseminated through the lymphatics and the circulation in general, and that therefore the cure of thyroid cancer will as a rule only be in people between 50 and 70, the total removal of the gland being indicated. He also laid stress upon the necessity of an X-ray examination of thyroid carcinoma cases in order to rule out involvement of the chest and lung, stating that no secondary carcinoma of the breast should come to operation without this precaution being taken.

#### THE SURGICAL TREATMENT OF GRAVES'S DISEASE.

DR. WILLIAM S. HALSTED, of Baltimore, read a paper with the above title, discussing especially the excision of both lobes, and the ligation of the inferior in preference to the superior thyroid artery, for which see page 178.

#### HYGROMA CYSTICUM COLLI.

DR. CHARLES N. DOWD, of New York, read a paper with the above title, for which see page 112.

DR. JOHN B. MURPHY, of Chicago, called attention to the fact that in hygroma cysticum colli if only a portion of the tumor is removed there is a rapid return with enormous increase in size and secretion, and that these frequently undergo malignant degeneration.

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possibility that the lesion may be a carcinoma of a type in which, experience has demonstrated, the neighboring lymphatics should also be radically extirpated.

Group III. In this series the diagnosis of malignancy would indicate a more radical operation with mutilation and, in some instances, increased dangers from the operation, while, if the lesion were still benign a cure could be accomplished with less or no mutilation and less danger.

From his investigations the author is confident that we have sufficient evidence to indicate to the surgeon the proper operation in each group with best results for the patient.

In the first place, the surgeon must have the easily available knowledge of the different pathological processes which may occur in definite localities. He must be familiar with the methods of diagnosis of the lesion in this special region and the nature and extent of the operation which promises the best results. The diagnosis as to the proper treatment rests upon, first a careful study of all the available clinical evidence. In some cases this is sufficient to indicate the proper treatment without a gross or microscopic investigation. This is true for palpable masses in the stomach and colon. The resection of such masses, without an investigation of their gross and microscopic pathology by cutting into them, yields the best results with the least mutilation and danger. If the pathological examination after their removal shows a benign lesion the patient is protected from the later development of cancer; if, on the other hand, it should prove to be malignant, the chances of a cure are best.

As examples of Group I, we may mention benign pigmented moles, warts, small subepidermal nodules, and subcutaneous more or less encapsulated tumors.

In the second group we may mention a lesion on the lower lip. Here the lesion may be radically excised with a V-shaped piece without danger or mutilation, and the wound closed. Then a frozen section is made and if it proves to be a carcinoma of the spinocellular type, the glands under the jaw should be completely removed through a separate incision. This operation in two stages and without continuity dissection has been demonstrated to fulfill all the requirements. With an early lesion on the tongue the method is entirely different, because for the malignant nodule or ulcer the local operation must be more extensive. In a case of this kind, under general or local anæ-

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the best opportunity of a cure with the least mutilation and danger.

As the campaign for the education of the people on the early signs and symptoms of what is or may be cancer bears fruit, surgeons will be called upon more and more to treat these lesions in a stage in which accurate diagnosis is more difficult and where the dangers of incomplete removal, following an inaccurate diagnosis, increase with the space of time between the first signs and symptoms of the disease and the date of treatment.

DR. JOHN B. MURPHY, of Chicago, agreed with the author that the final court of appeal in these cases is the clinical result and not the microscopical report. He reported a case of sarcoma of the patella, the first symptom of which was slight pain on trauma. A month or so later the patient while walking along the street was struck on the patella by a lady's handbag which the owner was swinging in her hand, and this caused him exquisite pain. On operation the condition of sarcoma of the patella was diagnosed, resulting in amputation.

DR. CHARLES H. MAYO, of Rochester, Minn., suggested that in border-line pathological lesions where an exploratory operation could not immediately, if necessary, be followed by diagnosis from a frozen section, the wound, even though the condition be considered benign, be packed with Harrington's solution No. 9 for several days until a microscopical report could be obtained. He particularly emphasized the point of not closing such a wound, advocating that it be left open and drained and the lymphatics burned with hydrochloric acid.

DR. ARPAD G. GERSTER, of New York, called attention to the possibility of tumors in the breast being either of tuberculous or syphilitic origin, therefore not requiring amputation, referring to many instances, however, where amputation has been performed under the impression that these conditions were malignant. He also spoke of involution mastitis based upon gout, of actinomycosis in the breast, and of the various systemic disorders which may be accompanied by swellings in the breast, emphasizing the point that not all swellings in the breast are necessarily on their way to malignancy.

DR. ROBERT B. GREENOUGH, of Boston, said that the hope of increasing the number of cures from malignant disease was based on the patients being seen in the early stages. He advocated that, even in the early stages of suspected cancer of the breast, the whole breast with the pectoral fascia be removed.

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tervention, died twelve days later from erosion hemorrhage caused by the pressure of the knot.

In our experiments, the object sought was to produce a gradual stenosis of the aortic lumen by infolding or plaiting the walls of the vessel in its longitudinal axis. In applying these sutures, they were made as nearly interstitial or interparietal as possible. Our experience, and that of others (Carrel, Haecker, Guleke) proves conclusively that through-and-through sutures in the walls of the aorta of dogs, applied with any tension, are liable to cut through and are followed by secondary hemorrhage from ulceration and necrosis when fatal hemorrhage does not occur from the immediate cutting through of the sutures in the course of the operation.

In the abdominal aorta this danger is lessened by the greater firmness and better quality of the vessel walls and by utilizing the peritoneum which is included in the grip of the sutures, as well as by the marked tendency here to the formation of organizable plastic exudates which further support and encapsulate the line of suture. This tendency is almost entirely absent within the thorax. In addition, the line of suture may be fortified with strips of this membrane wrapped spirally around the vessel, a procedure which Jeger seems to have recently carried out independently of our work.<sup>1</sup>

Our experience also entirely confirms the observations made by Carrel and Guleke, who found that the walls of the thoracic aorta become progressively more friable as the heart

<sup>1</sup> Professor Halsted in his epochal and masterful paper on The Effect of Ligation of the Common Iliac Artery on the Circulation and Function of the Lower Extremity, which was published in the *Johns Hopkins Hospital Bulletin*, of 1912 (see bibliography), refers to recent experiments performed upon the abdominal aorta with ligatures and tissue bands, which are quite pertinent to our inquiry. His experiments refer chiefly to the abdominal aorta, which are quite different from those on the arch and thoracic aorta. On page 217 he writes: "We noted in our experiments that the aorta of dogs after having been totally occluded by silk ligature, may again become patent. This restoration of the lumen is brought about by the cutting through of the ligature, and has usually been accompanied by the formation of a diaphragm of greater or less extent (see also *Jour. Exp. Med.*, 1909, vol. xi, No. 1). Similar obser-



Since then there have been numerous reports of cases in the literature, several articles coming from the St. Mary's Clinic in Rochester, the most recent of which by McGrath<sup>8</sup> reports on twenty-seven cases.

The reports of these cases of diverticulitis of the intestine are frequently from autopsy records, or from operative findings when the operation has been performed for some other condition, or after an incorrect diagnosis. Charles Mayo<sup>9</sup> reports making a probable diagnosis in seven of the twenty-seven cases reported. In some cases where resection of the sigmoid has been done for carcinoma, a preexisting diverticulitis has been found, probably as an etiological factor. Also, it has not been very rare in the past to see in the large general hospitals cases of apparently inoperable carcinoma of the sigmoid where perforation with resulting abscess has occurred; and after drainage, with or without development of a fecal fistula, the symptoms of carcinoma have disappeared.

Because of these facts, the history of the following case is reported as a typical case of acute diverticulitis, the history, symptoms, and physical signs being sufficiently pathognomonic to enable a diagnosis to be made before operation:

C. G., male, aged forty, referred to the writer January 8, 1912, by Dr. J. F. Bell.

His family and previous personal history have no bearing on the present condition beyond the fact that he had always been troubled with flatulence.

The first symptoms of the present illness appeared two years ago, when, after exposure to cold and wet while duck shooting, he was attacked by severe colicky pains in the abdomen, most severe in the left iliac region. Six months before the present attack, while on a train, had a similar seizure. He was ill for ten days, his temperature during this time ranging between 100° and 101° F.

Three days before the operation he had another attack of colicky pain, most severe in the left iliac region. His bowels moved with catharsis, but movements of the bowels or the pas-

# ANNALS OF SURGERY

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## ORIGINAL MEMOIRS.

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### THE AMERICAN SURGICAL ASSOCIATION. ITS INFLUENCE ON THE GROWTH AND DE- VELOPMENT OF AMERICAN SURGERY.

BY CHARLES A. POWERS, M.D.,

OF DENVER,

Professor of Clinical Surgery in the University of Colorado

THE American Surgical Association has now completed thirty-three years of active life, and in selecting a subject for a Presidential Address before it I have thought it not improper to consider some features in the history of this body, a history which has been at all times highly creditable and of which we may well feel more than proud, together with some of the conditions which have attended the recent development of American surgery and the place which our school occupies in the modern surgical world. My treatment of this subject will necessarily be more or less discursive. I am fully cognizant of my own shortcomings in the matter of accomplished work but I have been a close student of surgical conditions in our country for thirty years and I have an unbounded pride in the splendid achievements of my fellow countrymen.

Our Association has exerted a profound influence upon the growth and development of American surgery we as

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\* Presidential Address Delivered before the American Surgical Association, Washington, May 6, 1913

[NOTE—For obvious reasons details regarding business matters pertaining to the affairs of the Association are omitted here—C. A. P.]

method of invagination of the upper into the lower segment, might have lessened the chance of a fecal fistula.

Five days after operation a fecal fistula developed, which slowly closed, leaving a small sinus which occasionally discharged gas, but this closed in July, and the patient now, more than a year after his operation, has no trouble except a slight weakness in the wound, where a small ventral hernia is developing. The bowels move naturally, without catharsis, once or twice a day.

Examination of the specimen removed showed a small opening in the mucous membrane of the intestine, through which a probe could be passed into the thickened mesentery, as is shown by the illustration. Microscopical examination proved that the margin of this opening was lined with epithelium, and the report from the pathologist was "diverticulitis of the sigmoid." (See Fig. 1.)

Articles on this subject within the past few years by Wilson and MacCarty,<sup>10</sup> Giffin and Wilson,<sup>11</sup> Wilson,<sup>12</sup> MacCarty,<sup>13</sup> Wilson,<sup>14</sup> Mayo,<sup>9</sup> McGrath<sup>8</sup> (all from the St. Mary's Hospital in Rochester); Rowlands,<sup>15</sup> Taylor and Larkin,<sup>16</sup> Cameron and Rippman,<sup>17</sup> Hartwell and Cecil,<sup>18</sup> Bruce,<sup>19</sup> Telling,<sup>20</sup> Barbat,<sup>21</sup> Abbott,<sup>22</sup> Erdmann,<sup>23</sup> and Powers<sup>24</sup> make more than a brief review of the etiology, symptoms, and treatment superfluous.

*Etiology.*—Diverticulitis is said by Telling<sup>20</sup> to be twice as frequent in men as in women. While the condition has been observed in children (Ashurst,<sup>24</sup> Hartwell and Cecil<sup>18</sup>), it is more frequent in the later decades of life. As to the direct causation, while many theories have been advanced little has been proved. An inherent or congenital weakness in the musculature of the intestinal wall seems to be the most probable predisposing factor, this weakness existing in relation to the points of exit of the veins in the intestinal wall. Obstruction to the return flow of blood in the mesenteric veins has been supposed in some cases to be a cause of this weakness. Traction on the mesentery has been suggested as a cause of weakness in the small intestine, as

individuals owe it more than we perhaps realize. I know that our distinguished Fellow, Dr Mears, an original member, has made this the subject of interesting and instructive contributions, but I have felt that the impressions of one who entered the ranks during the mid-period of the Association's life might prove of supplemental value

The beginning of our Association was simple and dignified. The project had its inception in the mind of that master surgeon, Dr Samuel D Gross, who confided details of his plan to a few of his friends at the meeting of the American Medical Association held at Atlanta, Ga., in May, 1879. It was agreed that on the following day, immediately after the adjournment of the surgical section of the Association, he should, in a brief speech, lay the plans agreed upon before that body. This having been done, the meeting was organized by the appointment of the eminent and venerable Dr L A Dugas, of Augusta, Professor of Surgery in the Medical College of Georgia, as Chairman and Dr. William W. Dawson, of Cincinnati, Professor of Surgery in the Medical College of Ohio, as Secretary. Brief addresses were made by different gentlemen, all cordially approving of the objects of the meeting. It being apparent, however, that the kind of an organization desired could not be then effected, nothing further was done on that occasion. Before separating Dr Gross and his associates decided that a circular should be sent to the principal surgeons of the United States, setting forth their plans and inviting co-operation at a conference to be held in New York during May or June, 1880.

Organization was perfected at this next meeting which was held in the lecture room of the college of Physicians and Surgeons, Twenty-third Street and Fourth Avenue, New York City, on May 31, 1880, forty-eight gentlemen signing the constitution and thus becoming Fellows<sup>1</sup> of the Society.

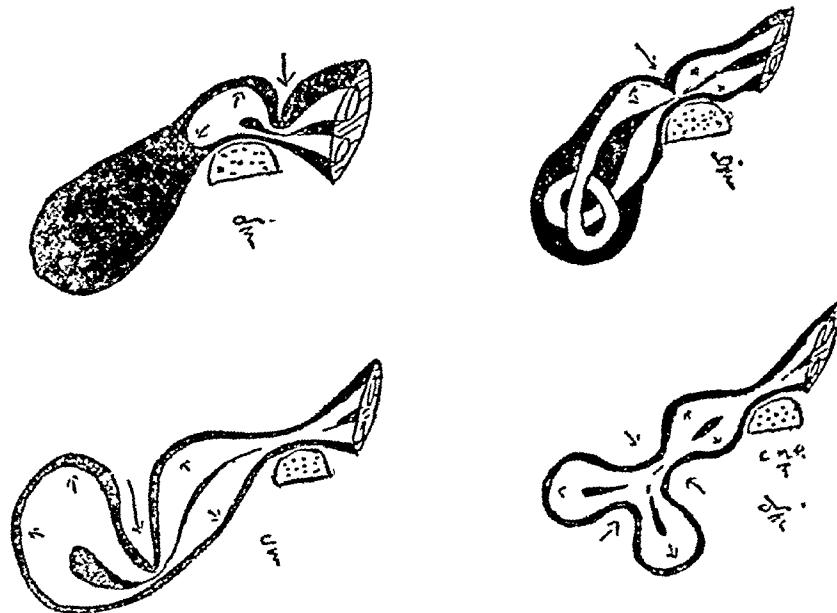
Dr Gross was made President and Dr Weist, of Richmond, Ind., Secretary. A Constitution and By-Laws were temporarily adopted. The next meeting was held in Rich-

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<sup>1</sup> Of these forty-eight gentlemen but three, Drs Keen, Mears and Marks, are now living.

nerves blocked and divided and a congenital sac filled with bloody fluid and strangulated omentum found. Digital examination revealed, higher up, what appeared to be a hernia reduced *en masse*. Abdominal exploration revealed the following: omentum and small intestine running through internal ring and into hernial sac, the "ring" having been displaced inward so that the swollen omentum had completely hidden the bowel in the sac. Divulsion of the ring and excision of the omentum allowed reduction of the bowel into the protected general cavity. The wall everywhere

FIG. 1.



Hernial sacs seen in cross section representing, schematically, intestinal compression and dilatation due to pressure applied above the ramus (Case IV); over the ramus (Case V); to the scrotum (Case II); and manipulative pressure applied to the scrotum (Cases I and III).

was in good condition even where compressed by the ring except for two ruptures, one completely through the circumference of the wall (Fig. 2, c) the other partially through (Fig. 2, d). General condition called for a quick enterostomy and tubes were inserted into both openings. A partial operation for hernia was performed quickly. Patient never rallied. Death in 24 hours.

CASE II.—J. L., aged forty-seven. Seven hours previous, while running for a street car, patient tripped and fell, striking a rather large inguinal hernia upon a cobble stone. Intense abdominal pain, nausea, and vomiting followed. Patient restless at examination. Pulse strong, slow, regular. Abdomen scaphoid; entire absence of respiratory movements; C. M. well marked; no

mond, Va., May 5, 1881, nineteen Fellows being present. No scientific papers were presented. The meeting of 1881 was held at Coney Island, New York, September 13, 14, and 15. Eleven Fellows were present and five surgical theses were read and discussed. Dr. Gross was re-elected President.

The meeting of 1882 was held in the hall of the College of Physicians, Philadelphia, on the last day of May and the first two days of June. Twenty-five Fellows registered and fifty gentlemen, from various parts of the country, were elected to active fellowship. Fear had been expressed that the Association would affect the strength of the American Medical Association. This was vigorously denied by Dr. Gross,<sup>2</sup> who said. "We can hurt no Society now in existence, or likely to come into existence. We can hurt only ourselves if we fail to do our duty. We hope to make the American Surgical Association an altar upon which we may annually lay our contributions to science, and so show to the world that we are earnest and zealous laborers in the interest of human progress and human suffering." Dr. Gross claimed that the American Medical Association would be strengthened by the new organization. That his prediction came true is realized by all of us who attend the splendid meetings of the Section on Surgery of that body.

At this meeting of 1882 four scientific papers were read and discussed, a large portion of the time of meeting being occupied in perfecting organization. Although he vigorously protested, Dr. Gross was again elected to the Presidency.

The meeting of 1883 was held in Cincinnati, forty Fellows signing the register. The Association urged its venerable President to accept a re-election, but this he steadfastly declined and the eminent Dr. E. M. Moore of Rochester, New York, was made his successor. Before adjourning the following resolution was unanimously adopted. "Resolved. That a vote of thanks be returned to our retiring President, Samuel D. Gross, and that the members of the Association unite in the hope that he may long be spared to meet with us."

<sup>2</sup>Dr. Gross had been the Chairman of the Section on Surgery of the American Medical Association in 1867, 1870 and 1873.

In addition to the cases listed in the preceding table, Richelot,<sup>20</sup> speaks of Hartman<sup>26</sup> and Murtry,<sup>27</sup> each having seen one case, LeDentu, two cases and Péan<sup>29</sup> "many more." Christopher Martin<sup>30</sup> is reported to have seen seven instances of malignant disease in the cervical stump after supravaginal hysterectomy, developing from a few months to several years after operation. Ladinski<sup>10</sup> states that he has seen three cases in the addition to the one noted in the table. Savor<sup>21</sup> speaks of a case seen by von Hacker<sup>31</sup> and Olshausen<sup>18</sup> refers to one noted by Pawlik.<sup>32</sup> Batigne,<sup>33</sup> Condamin,<sup>34</sup> Krusen and Hammond<sup>35</sup> have also reported cases but I have been unable to secure their references. In the table, there are thirty-six cases, while about twenty more have been casually mentioned in the literature, making a total of somewhat less than sixty cases reported up to the present time.

The fact that carcinoma has occasionally developed in the cervical stump after a supravaginal hysterectomy has often been used as an argument in favor of panhysterectomy whenever circumstances demand the removal of the uterus, and indeed a number of surgeons have abandoned the subtotal operation on this account alone. When one considers that of the many thousands of supravaginal hysterectomies performed this complication, serious as it is, has been reported in less than sixty cases, it would seem that the abandonment of the operation on this account, for panhysterectomy with its higher primary mortality and familiar disadvantages, is unjustified. Botzong<sup>2</sup> in 724 cases of supravaginal hysterectomy, collected from representative European clinics, reports a primary mortality of 2.61 per cent., while in 499 cases of panhysterectomy the mortality proved to be 6.6 per cent. The occasional case of carcinoma developing in the cervical stump after supravaginal hysterectomy, even if considered as a life lost and added to the mortality statistics of that operation, would not materially alter Botzong's figures; panhysterectomy would still have a primary mortality more than twice as great. In other words, those operators who have abandoned subtotal hysterectomy for panhysterectomy through fear of sub-

to cheer us by his presence and to guide us by his wise counsels ”

The fifth annual meeting was held at Washington, April 30, May 1, 2 and 3, 1884, forty-three Fellows being present. The venerable founder was absent on account of illness, his paper on “Wounds of the Intestines” being read by Dr T G Richardson. On motion, the following telegram was ordered sent:

Professor SAMUEL D GROSS, Philadelphia

The American Surgical Association has listened with pleasure and profit to your paper, regrets your absence, and sends the sympathy of all of its Fellows and their hope for your speedy recovery.

Edward M Moore,  
President

Important papers were read and discussed, and on the fourth day of the meeting the following additional telegram was ordered sent:

Prof S D GROSS, Philadelphia

The Fellows of the American Surgical Association are unwilling to depart until they are able to learn whether their hope for the improvement of your health has been realized.

This hope was not to be made real, for three days later the great surgeon entered upon his long rest. His own hope had, however, been realized, the American Surgical Association which he had founded and sustained had lived and grown and become an honor to him.

It is not possible for one to study the volumes of the Transactions or the book of Minutes without feeling that the broad and lofty spirit of the Founder and his colleagues pervaded all that was done. Thus, in the presidential address of the meeting of 1885 the eminent Dr William T Briggs, of Nashville, said “We may safely indulge the confident expectation that this meeting will be characterized by the spirit in which the Association had its origin, and will be pervaded by the same united purpose, the same harmonious and agreeable intercourse and similar valuable work to that which has edified and instructed us in previous meetings, and

removal of the uterus for pathological conditions other than myomata, are so few compared to the many thousands of supravaginal hysterectomies for these conditions as to be practically negligible. Their percentage of frequency would certainly not exceed and probably not equal that of carcinoma of the cervix in any group of women. As Winter<sup>38</sup> has said, the question of carcinoma of the cervical stump is so intimately associated with the consideration of the combination of myomata and cancer that a discussion of one is incomplete without due notice of the other.

Of late years, a rather extensive literature has accumulated indicating the frequency of cancer of the uterus associated with myomata. Dr. Noble,<sup>16</sup> in discussing Currier's paper at the meeting of the American Gynæcological Society in 1906, drew attention to the fact that the evidence at hand, that the presence of fibroid tumors of the uterus led to cancer, was overwhelming, and in the same year reported 8 per cent. of cancer in his last hundred cases of myomata of the uterus. Winter<sup>38</sup> has published some statistics very interesting in this connection. To his lists below, I have added the figures reported by Dr. Noble and Dr. Cullen.<sup>39</sup>

FREQUENCY OF CANCER OF THE UTERUS WITH MYOMATA.

Hofmeier .....	445 cases of myomata uteri..	17 cases
Winter .....	753 cases of myomata uteri..	23 cases
Noble .....	1188 cases of myomata uteri..	41 cases
Cullen .....	1400 cases of myomata uteri..	43 cases
Total .....	3786 cases of myomata uteri..	124 cases

Of 3786 cases of myomata of the uterus 124 cases, or *slightly over three per cent.*, showed cancer of either the body or cervix. No reliable statistics of the absolute frequency of cancer of the uterus exist, but to place it at three per cent. would be absurd. The assertion that myomata exert an influence favorable to the development of cancer of the uterus is therefore incontestable. This influence is even more clearly demonstrated when we compare the relative frequency of cancer of cervix and body of the uterus, when these conditions

which, in the brief period of its existence, has so illustrated the usefulness of the Association, that its permanency as an exponent of the status of American Surgery, and as a factor in the true advancement of its science and art, is fully assured ”

At this meeting of 1885 the first of the foreign Honorary Fellows were elected These were Paget, Lister, Erichsen, Annandale, von Volkmann, von Nussbaum, von Esmarch, von Czerny, von Billroth, von Langenbeck, Ollier, and Verneuil Of these twelve distinguished European surgeons but one, von Czerny, survives.

At the meeting of 1886 Dr C H Mastin, of Mobile, proposed the union of nine of the special associations under the title of, “The Congress of American Physicians and Surgeons,” and in due course of time, and largely through the patient labor of Dr Mastin, this Congress was formed, practically under the organization which governs it to-day No comment need be made regarding its success, once in three years we all meet, at this suitable season of the year and in this beautiful city of Washington, and I feel sure that it is both interesting and instructive for the members of the various Societies to renew old acquaintance and profit by the reports of the advances which are being made in the various departments of Medicine other than those in which they are most actively engaged

At the meeting of 1891 a Committee on the Address of the President, Dr Mastin, recommended “That the President be empowered to appoint a committee with authority to confer with the friends and admirers of the late Professor S D Gross, and with the profession at large, for the initiation of a movement on the part of the Association, having for its object the erection of a monument to Dr Gross, in the City of Washington ’ A Committee of twenty-six of the Fellows under the Chairmanship of Dr J R Weist, of Richmond, Ind , who had earnestly and ably served the Association as Secretary since its foundation, was appointed to forward this project Their labors were successful, and in 1897 the dignified statue of our Founder, suitably placed in the city in which

opening into the pleural cavity under these circumstances for the purpose of drainage would inevitably result in the complete collapse of the lung, and with the existing perforation in the lung there would be little tendency for the latter to expand, and a chronic empyema would result. Therefore, instead of free drainage, the pus was repeatedly aspirated at intervals of twenty-four hours, and the air was continuously withdrawn by means of a large hollow needle introduced above the fluid line, connected with a tube which was immersed in water in a bottle standing on the floor. By these measures the pleural cavity was kept practically empty, because on coughing any air that was pumped from the lung into the pleural cavity was immediately expelled through the needle and escaped under the water. The water valve prevented aspiration into the chest through the needle. When first inserted, there was a positive pressure which forced air out in considerable quantity; the pressure then sank to zero, and air only flowed when coughing.

The pus aspiration and the equalization of the air pressure was kept up in this way for one week, during which time the patient's general condition was much improved, the temperature, pulse and respirations dropping to normal. During the last three days of this period there was much of the time a negative pressure shown in the chest cavity by the sucking of the water up into the tube for a distance of ten cm. or more. This demonstrated that the perforation in the lung was growing smaller, and that some expansion of the lung was possible.

Under local anaesthesia, half an inch of the eighth rib was resected in the axillary line, and a self-retaining rubber bobbin was inserted through a small hole in the pleura. A tube was passed through the bobbin and connected with the suction bottle. In this way all of the pus was withdrawn, much of it having been too thick to flow through the needle, and the suction expanded the lung without evidence of opening, to any extent, the hole in the lung. By means of the snugly fitting bobbin, air was prevented from entering the chest through the pleural opening, and a clamp on the tube closed this means of entrance. Each day suction was applied to the tube, and in the intervals the tube was kept closed. The chest was thus kept empty of pus, and a certain amount of negative pressure maintained which resulted in a gradual expansion of the lung. All evidence of air passing

we are now meeting, was unveiled with appropriate ceremonies

Allusion has already been made<sup>3</sup> to the important meeting of the International Surgical Society which will be held during the early part of the coming year in the City of New York. We are not to forget that the original suggestion for the formation of such a Society had its inception in the mind of our esteemed Fellow, Dr Keen, who set forth a definite design at the meeting of our Association in 1895. Although fruition did not attend this particular plan the seed which he sowed fell on good ground, and I think it quite safe to say that it indirectly resulted in the formation of the dignified international surgical body which held its first meeting in the City of Brussels in 1905.

It would be trite to dwell on the advances which have been made and which are being made in Surgery. The progress has been as constant as it has been efficient. The scholarly Cheever in his address before this body in 1889, discussing the future of surgery, gave under the heading of operations as yet *sub judice*, or on trial Resection of the pylorus, resection of cancerous intestine, of omentum, removal of the spleen, of large bronchoceles, of the larynx, the pancreas, the prostate gland, the normal ovary, fixation of the kidney, of the uterus, puncture of the pericardium, opening gangrenous abscesses in the lungs, tapping the ventricles of the brain. It need not be said that with the exception of the removal of the normal ovary all of these are ordinary procedures of to-day and that to these fields very many others have been added. "By the work one knows the workman", I have already said that I feel unbounded pride in the work of the American surgeons who have gone before us, or who are now, as Seniors, resting from their labors, and of those still in, and approaching, their most productive period. It has been well said that "The achievements of its citizens are the most valuable assets of a country", it is in a spirit far from boast-

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<sup>3</sup> See previous note regarding the omission of certain details relating to the business of the Association

The man was a mouth-breather and had very little sense of smell.

The wound caused by amputating the finger healed by primary union. The tip of the last phalanx seemed to be solidly united to the frontal bone. During the 21 days that the finger remained attached to the face and hand, the patient's nourishment was restricted to fluids and administered through a tube passed into the angle of the mouth. At the outset of the operation, it was planned to wait but fourteen days before amputating the finger, but at the expiration of that time the patient was so comfortable that it was deemed safer to wait another week.

#### ARTERIOVENOUS FEMORAL ANASTOMOSIS (LATERAL TRANSVERSE) FOR THREATENING GANGRENE.

DR. McWILLIAMS presented a man fifty-three years old, a physician, who lost the last two phalanges of the second left toe, in 1903, by gangrene. Six years ago Dr. McWilliams amputated the right leg at the junction of the upper and middle thirds for a gangrenous condition of three toes which extended up on the foot for two inches. At that time he realized the danger of the stump not healing, but decided to run the risk of doing a low amputation, in view of the fact that the man was dependent for his living on having as serviceable a limb as possible. There had never been the slightest trouble from this stump, and the left foot remained free from further disturbance until two years ago, when the stump of the second toe became painful. Subsequently, the end broke down and has remained unhealed until the present time, being covered by an indolent crust. In November, 1912, the stump of the second toe became discolored and very painful. Two months later the pain had extended to the third, fourth and big toes, which also became dusky and tender. There was also intense pain and discoloration over the instep, and considerable oedema of the foot, gradually diminishing up to the ankle-joint. Walking was impossible, and a most striking feature was the icy coldness of the extremity.

The patient entered the Presbyterian Hospital on February 10, 1913, expressing the hope that anything be done except an amputation. An end-to-end vessel anastomosis has been performed in a number of these cases, but the disadvantage of this method was that, if anything went wrong with the anastomosis, then the gangrene was made much worse. Dr. McWilliams

ing that I say that my fellow-members of this Association have contributed constantly and effectively to the splendid progress which has placed modern surgery among the brilliant phenomena which characterize the last quarter of a century. This sentiment, to which I give expression, is a part of myself, and the thought leads me to ask, in a tentative way, whether we have not at this time and in this country a distinctive school of surgery? Definite answer to this must be made by our colleagues in other lands, and yet, as one views and reviews the leading clinics of the United States and of Canada he feels that there are certain marked characteristics which leave their impress on the mind of the impartial observer. Can these impressions be expressed in words? Not easily, yet an attempt may be made.

One marked characteristic of our surgery would be, perhaps, a very broad spirit of catholicity and eclecticism. From the earliest days our surgeons have traveled, have studied, have gathered and brought back and placed in practice the best which they have found in other countries.<sup>4</sup> This has not been mere imitation, it has been intelligent selection. Further, our students and teachers have constantly added to the fruits which they have gathered abroad. The surgery of the brain and spinal cord, of the thyroid gland, of the breast, of the abdomen—especially the regions of the appendix vermicularis, of the gall-bladder, of the stomach, of the duodenum, of the large intestine—gunshot wounds of the abdomen, the surgery of the urinary bladder, of the prostate gland, of the cardiovascular system, of the joints, to mention but a few especial regions, all bear eloquent testimony to their labors. Again, they have made a practice of journeying constantly, for surgical study and observation, in this country. The meetings of the Society of Clinical Surgery form an admirable example of this, and we have, throughout the land, centres of clinical study to which our surgeons go more and more frequently. Further, this excellent habit of study-travel affects the sur-

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<sup>4</sup> It is not possible to in any way give adequate expression to the feeling of debt which we owe to the surgeons of other lands.

## ILEUS FOLLOWING GANGRENOUS APPENDICITIS. 413

and left the hospital on March 1, 1913. By that time the œdema had entirely disappeared and thus far it has not returned, even after walking. There was also a disappearance of the tenderness and pain in all of the toes, save in the stump of the second toe, which has remained tender and painful. There is now no popliteal pulsation to be felt. Over the site of the anastomosis one can hear a thrill with the stethoscope.

In connection with this case, Dr. McWilliams raised the query whether it would be advisable to remove the stump of the second toe. Would the wound heal or not? In cases of threatening gangrene the method seemed worthy of trial, but where gangrene had already set in to any degree, it was useless to do it, for the vessels were impervious. It might, however, permit one to do a lower amputation than was usual.

As to end-to-end *versus* lateral anastomosis, the speaker added that Wieting, of Constantinople, who had done considerable work in this field, had come to the conclusion that a lateral anastomosis ought to be the method of choice, and he himself now restricted himself to that method.

## ILEUS FOLLOWING GANGRENOUS APPENDICITIS WITH GENERAL PERITONITIS.

DR. MCWILLIAMS presented a boy, thirteen years old, who was admitted to the Presbyterian Hospital, in the service of Dr. George Woolsey, on August 16, 1912. A median suprapubic incision was made by Dr. Woolsey, the appendix was removed, a large amount of free pus evacuated, and two cigarette drains introduced into the right flank. The operation was followed by excessive distention of the abdomen, which was unrelieved by enemata, and three days later Dr. McWilliams punctured the cæcum in the wound. This afforded great relief, and the peritoneal irritation soon subsided. On the fifteenth day the boy awoke with pain in the left abdomen; he vomited and there was again marked abdominal distention which could not be relieved by enema. His pulse, which had been practically normal, went up to 120, and on the following afternoon he had two convulsions.

Operation by Dr. McWilliams, eighteen hours after the onset of the pain: On account of the fulness in the left iliac fossa, an incision was made through the left rectus. Numerous adhesions between the intestines were encountered, with several col-

geons in the smaller towns, greatly to the advantage of both teacher and student, using the latter word in the sense that all thinking men remain students

When we look over the list of surgical text-books published in this country we find reflected in no small degree the work and influence of the Fellows of this Association. Further, the books themselves will, I believe, bear favorably a comparison with those of other lands, their number and importance increase rapidly from year to year. Again, our surgical journals may well give us cause for pride.

In considering other salient features of our professional work I venture the thought that no men in surgery surpass ours in innate consideration for the best interests of the individual patient. Witness the care with which cases for operation are selected, witness the attention given to such important matters as anæsthesia, witness the desire for excellence in end results, witness all that makes for evenness in surgical work. The training and development of our nursing force in surgery has been no small factor in placing our surgical work where we find it to-day. Our training schools of nurses justly command the admiration of the surgical world.

Surgery with us attracts the very best of young men, young men of high ideals, of noble purposes, diligent, earnest seekers of the truth. It affords these young men abundant problems for solution, and our laboratories and wards bear testimony to the efforts which they are making. Many of these accomplished young men leave the metropolitan centres in which they have received their preliminary training and go out into the smaller cities and towns, there to develop hospitals in which much reliable work is accomplished. But I cannot refrain, at this time, from again calling attention to the absolute necessity for thorough preparation and training in surgery. Dr Richardson made this the subject of a forceful address in 1907, an address well worth reading and re-reading, while Dr Finney has recently emphasized the prevalence and danger of irresponsible surgery while address-

Recently, Waugh (*Quarterly Jour. Med.*, 1911, iv, p. 521) in a critical review of the use of tuberculin in so-called tuberculous glands concludes "that any estimate of the value of injections of tuberculin in the treatment of enlarged glands must be invalidated by the fact that *no proof* that the glands were tuberculous can be offered until the glands have been subjected to operation." He reports that of 130 cases of presumably tuberculous glands where the tonsils were dissected out, 16 (12.3 per cent.) came to radical operation and 13 (10 per cent.) developed local abscess formation. Of 51 cases where tonsillectomy was followed by tuberculin treatment, 10 (19.6 per cent.) came to operation and 9 (15 per cent.) developed abscess; (in three cases where no primary focus existed, and treated with tuberculin, all recovered). Bennett, although he advocates its use, does not believe that tuberculin does much good and thinks that many cases of recovery are due to the improvement of hygiene and the food supply. Sutcliffe states that the cases in which apparent benefit has resulted are precisely those cases that would have recovered equally as well without it, and that the observation of children treated with and without tuberculin revealed no perceptible difference in the rate of absorption of the diseased nodes.

*The X-rays.*—The action of the X-ray in these cases is still uncertain because of the unfortunate habit which some radiographers have of exaggerating the "magical" properties of the rays. A number of writers have advocated this form of treatment to the exclusion of everything else, during the last few years and they habitually attack operative procedures as dangerous, disfiguring or subject to failure. But as has been said, bad surgery is not a contra-indication to operation and if a surgeon does not know how to operate for tuberculous glands in the neck he had better turn to other forms of treatment.

PANCOAST (*Penna. Medical Journal*, February, 1909) in a letter to Dr. Frazier believes that while the X-ray deserves recognition as a valuable and efficient adjunct to surgery in the treatment of tuberculous adenitis, certain fundamental facts concerning its therapeutic action should be borne in mind. He believes that: (1) The X-rays have no direct bactericidal action upon the tubercle bacilli; (2) their probable action is an indirect one, a stimulating effect upon the surrounding healthy tissue cells and an increase in their nutrition; (3) the rays hasten destruction of cells of lowered vitality and the suppurative process in enlarged glands in which caseation has begun may be hastened; (4) the X-ray is a valuable adjunct to surgery in simplifying operation, preventing recurrences, promoting healing in suppurative and serious cases and greatly improving the cosmetic result.

ing the Southern Surgical and Gynæcological Association. Not every man who is practising surgery to-day is worthy of the name of surgeon. Experience is still a good teacher despite the fact that aseptic technic renders many ill-considered operations comparatively safe as regards the life of the individual. There is no royal road to surgery, and the long years of apprenticeship which our predecessors underwent and which we went through are as necessary at this time as in their day and ours. It is a long step from the mere operator to the real surgeon. The pseudo-surgeon is rife in our land as in others, and he is responsible in no small degree for the growing tendency toward commercialization in surgery, that hideous monster against which our faces are so sternly set.

But I must not allow myself to digress from the central thought of my theme, pride in American Surgery, for the good so immeasurably outweighs the bad. Never was surgery so well taught in our medical schools as to-day, never were the medical schools themselves progressing so rapidly toward higher and better standards. Never before has surgical research work been carried on with such earnestness and thoroughness. Cheever, in 1889, in the scholarly address to which reference has been made, took as his thesis "The Future of Surgery Without Limit", the same subject might well be chosen to-day and one might well make the forecast that the fields which are *sub judice*, or on trial, at this time, will have been conquered at the end of another quarter of a century. In the coming years, as in the past, American Surgeons will bear well their part, and the Fellows of this Association will carry high the banners left in trust by Samuel D. Gross and his colleagues.

This, then, is my *professio fidei*. A deep reverence for the traditions of our craft and for the traditions of this Association, a profound regard and admiration for the surgical work which has been done and which is being done in our country, and a clear and steadfast confidence in all which our surgical future may have in store.

caseous contents of the nodes and if such occurs the wound should be mopped out with Harrington's solution or tincture of iodine. Perfect haemostasis must be secured at the close of operation, blood clots favoring wound infection. Drainage and wound closure have already been discussed.

There are two complications that deserve mention. Soft, bulging caseous masses are perhaps best treated by aspiration and the injection of iodoform emulsion and formalin, although our experience with this method has not been very satisfactory. We prefer a small incision, curettage of the cavity with gauze, thorough disinfection with Harrington's solution and drainage with rubber tissue; care should be taken that the entire cavity has been opened and that we are not dealing with a so-called shirt stud collection with an outer pocket on the deep fascia, and an inner pocket beneath. If such cavities are encountered at operation every bit of the wall must be excised. If the symptoms indicate that mixed infection has occurred, hot fomentations may make incision more easy and safe to execute, but delay is not justifiable if the infection is extending down under the cervical fascia or symptoms of general septic infection are threatening.

Where sinuses, indurated areas, and old thick scars are encountered there is no better treatment than curettage of the sinus and exposure of the neck to the X-ray. Tuberculin is of notable value in such cases and its use is based on sound reasoning.

The after treatment of these patients is of particular importance. While an operation may remove at one stroke all the infected tissue, yet the patient's resistance to tubercle infection is low and his surroundings still with him. The hygiene is of particular importance but need not be discussed here.

In conclusion I might summarize our own views somewhat as follows: After a careful history has been obtained and an examination made the portal of entry can usually be surmised and if necessary the tonsil, adenoid or carious tooth should be removed, or any ulcer, scab, pediculosis, otitis, etc.,

# FIBROMATOSIS OF THE STOMACH AND ITS RELATIONSHIPS TO ULCER AND TO CANCER.\*

BY ALEXIS THOMSON, M.D.,

OF EDINBURGH

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AND

JAMES M. GRAHAM, M.D.

From the Surgical Department, University of Edinburgh

WE propose in this paper to give a general account of the condition known as fibromatosis of the stomach, for it is the lesion which is most often mistaken for cancer.

We have chosen the term "fibromatosis" because it expresses the most striking feature of the lesion without conveying any view as to its nature or etiology. From the fact that we always found it associated with ulcer, "ulcer-fibromatosis" would probably be a more accurate term.

Although the condition has been known for the greater part of a century, there has always been, and there are still, the most widely divergent views as to its nature. Cruveilhier felt sure of his ground, for his paper, published in 1835, was entitled "Innocent Hypertrophy of the Pylorus." English authors, notably Brinton, who described the condition under the term "cirrhosis of the stomach" or "linitis plastica," and Handfield Jones, who employed the term "fibroid induration of the stomach," had also no doubt, it would appear, of the innocent nature of the affection. With the advent of more accurate methods of histological examination, in which German pathologists played a prominent part, there arose a confident and apparently unanimous opinion that Cruveilhier's innocent hypertrophy and Brinton's cirrhosis represented an atypical form of carcinoma.

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\* Read before the American Surgical Association, May 6, 1913

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We have been fortunate in acquiring a number of specimens in a good state of preservation, chiefly derived from our own clinic, but largely augmented from those of our colleagues, and we are specially indebted to Professor Caird for generously placing a number of the specimens from his collection at our disposal. Our material consists of the following specimens almost exclusively obtained from the operating theatre: Fibromatosis, 9, fibromatosis with ulcer—cancer, 5, tuberculosis with cancer, 1, cancer—specimens specially selected for examination, 35.

We do not mean to imply, because our investigations have been carried out on a larger scale than was available to those who have preceded us in this inquiry, that we have reached anything like finality on the subject, but we claim to have made a number of reliable observations. We use the word reliable with confidence, because in the examination of the more difficult specimens, we have had the advice of two expert pathologists, Dr James Ritchie, Superintendent of the Laboratory of the Royal College of Physicians, and Mr Richard Muir of the Pathological Department of the University of Edinburgh.<sup>1</sup>

We believe that we are in a position to clear up, in some measure, the long-standing controversy as to whether fibromatosis of the stomach is innocent or malignant. We have found that in some cases it is innocent, while in others it is associated with cancer. The controversy owes its origin to the fact that there occurs in the stomach a diffuse infiltrating form of scirrhous cancer which in its distribution resembles fibromatosis, while at the same time it differs so much in its naked-eye and microscopic appearances from the classical forms of gastric carcinoma that its true character is not capable of being established without a thorough histological examination. The controversy has also been kept alive by the fact that when cancer involves a stomach that is already the seat of

<sup>1</sup> We are also indebted to Mr Pirie Watson, M.B. and Mr R.C. Alexander, M.B., Assistants in the Surgical Department, and to Mr Frank Pettigrew, technical assistant in the same department, for many of the illustrations.

EXCESSIVE THICKENING OF THIERSCH GRAFTS  
CAUSED BY A COMPONENT OF SCARLET RED  
(AMIDOAZOTOLUOL).<sup>1</sup>

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INTRODUCTION.

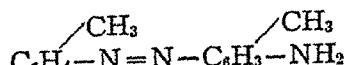
THERE has been some skepticism expressed at one time or another in regard to the power of epithelial stimulation claimed for certain of the organic coloring matters (scarlet red; soudan III; azodolen; pellidol, etc.), when applied to granulating wounds.

To my mind this matter has been settled beyond a doubt, as, during the last four years a number of enthusiastic articles have been published by well known investigators concerning the satisfactory use of these substances. These papers almost uniformly report splendid clinical results in hastening the healing of sluggish granulating wounds of varying etiology, and in every situation.

As is usual when a promising new therapeutic agent of this type is brought to the attention of the medical profession, it has been used by many who are not familiar with the prin-

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<sup>1</sup> Amidoazotoluol is an amidoazo compound employed as an intermediate product, which, when combined with Beta naphthol, forms the scarlet red originally used, experimentally, by Fischer,<sup>a</sup> for the production of atypical epithelial proliferations; and first used, clinically, by Schmieden.<sup>b</sup> Amidoazotoluol was first used clinically by Hayward.<sup>c</sup> It has the formula—



<sup>a</sup> Münch. med. Wochenschr. Nr. 42, October 16, 1906, S. 2041.

<sup>b</sup> Zentralbl. f. Chir., Nr. 6, February 8, 1908, S. 153.

<sup>c</sup> Münch. med. Wochenschr. Nr. 36, September 7, 1909, S. 1836, and Deutsche Zeitschr. f. Chir. Bd. 112, 1911, S. 467.

fibromatosis, the evidence of its presence in the stomach is not always easy to find, whereas it is readily discovered in the associated lymph glands

Our material was prepared as follows the resected portion of the stomach was fixed in Jeré's fluid, and after being embedded in paraffin, complete sections were cut, stained for the most part in hæmatoxylin and eosin, and mounted for examination under a low power of magnification These large sections enabled us to study the distribution of the disease and the gross changes in the different coats of the stomach at different levels Small portions of tissue selected from different parts of the specimen were cut and stained for examination with higher powers, in order to observe the nature of the cellular elements and the minute changes in the tissues

*Fibromatosis of the Stomach*—The condition may be limited to a portion of the stomach, the localized form, or it may extend throughout the entire stomach, the diffuse form The localized form is not only the more frequent, but it is the form which, from the clinical point of view, is the most important to differentiate from cancer

*The Localized Form of Gastric Fibromatosis*—It nearly always commences in the vicinity of the pylorus and spreads from there toward the cardia, usually, but not always, showing a preference for the lesser curvature

*External Appearances*—There is a sharp contrast between the affected pyloric portion and the rest of the stomach; the latter is flaccid and collapses readily, whereas the affected portion is rigid, densely hard like gristle, the peritoneal surface, when free from adhesions, is white, pearly, and smooth While this external appearance resembles cancer, it may be said that fibromatosis forms a flattened, smooth-surfaced tumor, whereas a cancerous tumor tends to be more rounded in shape, and is often nodular on the surface, this distinction, however, is so general that it cannot be depended upon There is an absence of the cicatricial contraction that is so common a sequel of uncomplicated chronic ulcer, and

*Clinical History.*—White man, aged thirty years. Engineer. Six months before admission was severely burned in an oil explosion. The head, neck, both upper extremities and portions of the back and chest were involved, and his condition was serious. He was admitted to the Johns Hopkins Hospital in a critical condition and remained there for five months. While in the hospital skin grafting was resorted to a number of times, and considerable progress was made toward healing. He was discharged at his own request before healing was complete, and was referred to the Out-Patient Department for dressings. After several weeks his condition was unimproved, and, as the hospital was crowded, he was sent to the Union Protestant Infirmary, where he came under my care.

*Physical Examination.*—The patient was anaemic and emaciated. There were large unhealed areas on the scalp and on both arms and forearms. I will describe only the ulcer on the right arm, as this is the particular wound to be considered in this report (Fig. 1).

An extensive granulating wound occupied the entire circumference of the lower two-thirds of the arm, including the elbow and upper two inches of the forearm. The wound extended three inches higher on the outer than on the inner side of the arm. On the inner side an area of skin previously grafted extended up from the forearm to the bend of the elbow. The granulations were exuberant, oedematous and unhealthy. Practically all the skin of the forearm adjacent to the ulcer had been grafted before the patient came under my care. During the interval between admission to the Union Protestant Infirmary and operation on the right arm, the other unhealed areas were grafted.

The granulations of this wound were brought into healthy condition by irrigations, free use of nitrate of silver, balsam of Peru, curved scissors, etc. At the same time very marked progress was also made toward healing by stimulating the wound edges with 4 per cent. amidoazotoluol ointment, alternating every 24-48 hours with zinc oxide, or boric ointment. The newly formed skin edges were thick and stable, but showed no tendency to overgrowth. As the granulations were flat, firm and rose pink in color, in spite of the rapid stimulation of the wound edges, it seemed advisable to hasten the healing by grafting.

there is no suggestion of cicatricial stenosis of the pylorus or of hour-glass contraction of the body of the stomach

The glands along the curvatures, especially the lesser, are usually enlarged and firmer than normal, again suggesting cancer, but there is a greater tendency for them to retain their normal shape than is usual when they are infected with malignant disease. It goes without saying that we are not here considering advanced cases of malignant disease in which the appearance of the stomach and of the adjacent parts render the nature of the condition unmistakable.

Reference should be made to those cases of fibromatosis in which, when the abdomen is opened, the pyloric end of the stomach is found to be so buried in adhesion, matting it to the surrounding organs and to the omenta, and it may be also to the parietal peritoneum, that a satisfactory examination of the stomach is impossible, we believe that these represent the type of case in which either nothing can be done in the way of a curative operation, or at the most a palliative gastro-enterostomy or jejunostomy, and the patient, in spite of a gloomy prognosis, makes an unexpected and permanent recovery.

*Changes in the Coats and in the Interior of the Stomach —*  
The pyloric portion of the stomach is converted into a rigid, funnel-shaped tube, the lumen of which is greatly contracted. The increase in the thickness of its wall is remarkable, in some of our specimens it measures 25 cms.

In the majority of the specimens we have examined (7 out of 9), there is situated, in about the centre of the affected area, a deeply-punched-out ulcer; the surrounding mucosa, instead of being as soft as velvet, freely movable on the subjacent coats, and showing prominent rugæ, is firm and unyielding, is closely adherent to the submucosa, and presents a hillocky surface, corresponding to variations in thickness of the fibromatosis in the submucous coat. The altered appearance of the interior stops abruptly at the pyloric ring, while toward the cardia it gradually merges into the normal, in other words, there is no ridge at its margin. In

July 29. All the grafts last applied had taken, and *were of normal thickness*, no amidoazotoluol having been used. The first grafts had resumed, in some places, the appearance of normal grafted skin. In others, several areas had assumed a papillomatous formation. Some of these were of the size of a pea, and were adherent to the underlying clear skin by a small pedicle. Others were flattened mushroom-like masses, with overhanging edges, while other areas were adherent here and there along their edges, and not elsewhere, so that an instrument could be passed freely underneath them. Some of the thickened areas were  $1\frac{1}{2}$  inches in diameter, a single portion comprising about one-half of this, and the rest being made up of closely set papillæ, which extended above the surface of the skin from  $\frac{1}{8}$  to  $\frac{3}{8}$  of an inch.

Several of these areas were cut off, and normal looking skin was found beneath, except for bleeding at the points of attachment. Here and there masses of cheesy secretion could be pressed from under the overgrown areas, and this had the typical odor of the contents of an atheromatous cyst. Microscopic examination showed this to be made up of epithelial debris.

August 13. Some of the papillary overgrowths had been removed, and many others had dried out and fallen off, as the blood supply of the pedicles was gradually occluded. Those which remained were much less prominent than at the last note. A large part of the thickened grafts had assumed the level of the normal skin, which was of a pinkish color. These level areas gave no evidence of having undergone excessive epithelial stimulation.

The patient was discharged in excellent physical condition, and with practically complete healing of all his lesions.

October 15. The greater part of the grafted skin on the right arm was smooth, but here and there were scattered a few small, flat, dry, papillomatous overgrowths. These growths received their nourishment through very small pedicles, between which the formation was bridged. The patient was working at his usual occupation.

January 7, 1911. Practically all of the papillomatous growths had disappeared, and the area was covered with smooth, solid skin (Fig. 3).

one case the appearances are especially characteristic, there is a large, deep ulcer occupying the greater curvature about three inches from the pyloric ring, in the area of the ulcer all the coats have disappeared, its floor being formed by a layer of dense scar tissue, while over the fibromatosis in the submucosa which extends round the remainder of the circumference, the mucosa is adherent and undulating, and appears thicker than normal. In two of our specimens, there is no visible punched-out ulcer, but the mucosa, over the submucous fibromatosis, presents a smooth, atrophied appearance, which microscopical examination shows to be due to a superficial form of ulceration combined with fibrosis. The undulating, hillocky appearance of the interior of the stomach is sometimes exaggerated so that there are eminences separated by deep clefts, the mucosa then presents a polypoidal appearance, and we think that it is probable that some of the specimens described in the literature and in museum catalogues as "polyposis of the stomach" may be examples of fibromatosis of the submucous coat, in which the contraction of the newly-formed fibrous tissue has caused the mucosa to project in the shape of polypoidal masses into the interior of the stomach.

*The Presence of Ulcers and of Ulceration*—We devoted special attention to the condition of the mucosa of the stomach as we early suspected that a breach of surface of the mucosa would prove to be an antecedent of fibromatosis. We should like to restrict the term "ulcer" to the well-known punched-out defect in the coats of the stomach, easily seen with the naked-eye, and employ the term "ulceration or erosion" when the mucosa looks thin and wasted, and microscopical examination shows a partial disappearance of the glandular elements on the free surface, associated with chronic inflammatory changes in the interstitial tissue.

In nine specimens of fibromatosis limited to the pyloric end of the stomach, no less than seven showed a visible punched-out ulcer, situated, roughly speaking, in the centre of the affected area, in the remaining two specimens there was

superficial ulceration over the greater part of the affected area. In the majority of cases, the punched-out ulcer had spread through all the coats of the stomach.

*The Submucosa*—From being a thin, loose layer of areolar tissue supporting the larger blood-vessels and allowing the mucosa to move freely on the muscularis, it is converted into a thick, solid, tough white tissue, not so dense as keloid but resembling the consistence of a hard fibroma. It varies in thickness from 2 cm to 12 cm in different specimens and in different parts of the same specimen; in some cases it constituted  $\frac{3}{8}$  of the entire thickness of the gastric wall. On the cardiac side the fibromatosis tapers off gradually, on the pyloric side, it stops abruptly, usually at the pyloro-duodenal junction.

There is no difficulty in differentiating the fibromatosis from the scar tissue which frequently accompanies chronic ulcer, for, unlike scar tissue, it is uniformly distributed throughout the submucous coat, whereas, when the coats of the stomach are replaced by scar tissue, all traces of the original arrangement is lost.

*The Muscularis*—The muscularis is very commonly the seat of a *marked hypertrophy of the circular fibres*, this being a response to the increased strain upon the organ in forcing its contents through the narrowed pylorus. In the rare cases in which the pylorus is not involved by the fibromatosis, this hypertrophy is absent. Hypertrophy of the circular fibres is usually sufficiently marked to be easily seen with the naked eye. The hypertrophy of the muscle is most marked near the pylorus, and tails off gradually toward the cardia.

More characteristic, however, than the hypertrophy, is the *segmentation of the circular muscle*, which is divided up into bundles by partitions or septa of white fibrous tissue continuous with the fibrillated tissue of the submucosa. The brown color of the muscle renders this segmentation very obvious to the eye. Hypertrophy of the circular muscular coat is a common accompaniment of cancerous obstruction at the pylorus, and it may be quite as marked as in the stenosis due

to fibromatosis, but, so far as we know, it never shows the same degree of segmentation, and we have therefore come to regard it as a characteristic feature of fibromatosis. There is rarely any change in the longitudinal bundles of muscle.

The *subserous and serous coats* are little altered as a rule, but in some cases, they also are invaded by the fibromatosis and become correspondingly thickened.

*The Pylorus*—Narrowing of the pylorus is almost a constant accompaniment of fibromatosis, and it may reach an extreme degree. It is chiefly due to the increase in thickness of the submucous coat, but it is also contributed to by the contraction of this coat whereby the mucous membrane is projected into the lumen, often in the form of folds or polypoidal eminences. The function of the pylorus as a channel of exit for the gastric contents is further impaired by the unyielding character of the tissue forming its wall.

When the fibromatosis extends to the pyloro-duodenal junction, and this is looked at from the duodenal side, the mucosa is seen to project as a collar-like ridge, and the pyloric aperture is reduced to a narrow slit, which presents variations according to the distribution of the lesion. As in the hypertrophic stenosis of infants, this appearance has been likened to that of the os uteri, but the comparison is less apt in the case of fibromatosis, as the opening rarely occupies the centre of the channel.

*Microscopical Appearances*—Those necessarily vary at different stages of the process.

*Histological Changes in the Mucosa*—Reference has been made already to the invariable presence of a visible ulcer or of ulceration in the mucous membrane. We shall here describe the changes seen with the microscope. Many of the specimens show increase in thickness of the mucosa, this sometimes amounting to three times the normal thickness. Some of this thickening appears to be due to contraction of the submucous coat, crowding the mucosa into a smaller area, but it is chiefly due to actual increase in the amount of the

interstitial tissue In some specimens this interstitial change is very pronounced, a thick layer of chronic inflammatory tissue elements separating the secreting tubules from the muscularis mucosæ. More frequently the new tissue separates the tubules from each other, compressing them and causing their gradual disappearance In the progressive replacement of the tubules by young fibrous tissue there are appearances which might at first sight be mistaken for cancer, an attenuated tubule without a lumen may appear on transverse section like an alveolus filled with cancer cells, but further examination shows the continuity of the tubule with one opening on the surface and, further, that all the epithelial elements are superficial to the muscularis mucosæ Some tubules show cystic dilation, others show remarkable elongation Although there is no evidence of active mitosis or of proliferation of the epithelial cells, these changes might reasonably be regarded as precancerous in nature

The muscularis mucosæ is in some cases involved in the fibrosis, that is, the muscle fibres are separated by young fibrous tissue

The cellular infiltration, which is the main cause of the thickness of the mucosa, is composed mainly of small lymphocytes and plasma cells, with, in addition, a large number of proliferated endothelial cells and fibroblasts in an early stage of development Some large phagocytic mononucleated cells are also present There are no polymorpholeucocytes

These chronic inflammatory changes in the mucosa are associated with ulceration on the free surface and loss of the covering columnar epithelium It is noteworthy that this superficial ulceration is less in evidence in these specimens in which there is a visible punched-out ulcer, in the case already referred to on page 14, in which there is a large, chronic ulcer at the greater curvature, and a submucous fibromatosis in the remainder of the circumference of the stomach, the over-lying mucous membrane is intact We feel warranted

in making the inference from this observation that the changes seen in the mucosa in other specimens are primary in character. Were they secondary to, and a result of, the submucous fibromatosis, they would have occurred in this specimen. Our view is that the changes in the mucosa, particularly the ulceration, are primary, and are followed by the fibromatosis in the submucosa.

*Histological Changes in the Submucosa*—In the fully-developed condition, the submucosa is represented by a thick, uniform layer of fibrillated connective tissue. The fibres are not arranged on a fixed plan as in a tendon, but, although in parts parallel, they mostly run in all directions as they do in a fibroma or in other forms of fibromatosis, e.g., neurofibromatosis.

The connective tissue cells are scanty and are flattened between the fibres. Here and there are collections of lymphocytes in the vicinity of the muscularis mucosæ. There are numerous well-formed blood-vessels, presumably belonging to the original submucosa, and in addition there are a number of capillaries, more than was to be expected in view of the bloodless condition of the tissue as seen with the naked eye. There is a complete absence of endarteritis.

We are unable to confirm the observation that the fibrous elements of the submucosa undergo hyaline degeneration.

*The scar tissue* associated with ulcer, in contrast to fibromatosis, takes on more of the haematoxylin stain, the fibres do not present any regularity in their arrangement, the connective tissue cells are more numerous, and the tissue elements in the fully evolved condition, both fibres and cells, are more closely packed and are less vascular.

*Histological Changes in the Muscularis*—The changes observed in the muscle are mainly those of hypertrophy. In the early stages of fibromatosis, separation of the muscle bundles is confined to the inner layers of the circular coat. In well marked cases the fibromatosis extends throughout the circular coat and may also affect the longitudinal coat al-

though never to the same degree. The condition might be described as a coarse cirrhosis in which the muscle bundles are separated by fibromatosis which is continuous with and of the same character as that in the submucosa. At the same time small fasciculi and even individual muscle fibres are occasionally seen in the midst of the fibromatosis. The muscle fibres show no signs of degeneration, they appear capable of functioning and the only change observed is an increase in the number and in the length of the nuclei.

*Cases of Fibromatosis Associated with Ulcer-cancer*—The combination of ulcer-cancer with fibromatosis is especially difficult to identify without detailed microscopical examination. In one of Mr. Caird's specimens the chronic ulcer is situated 6 cm from the pyloric ring, on either side of it, the coats of the stomach are invaded and in parts replaced by an actively growing spheroidal-celled cancer, while beyond the limits of the ulcer there is a well-marked fibromatosis of the submucous coat with hypertrophy and segmentation of the muscularis.

In one of our own cases there is superficial ulceration of nearly two-thirds of the circumference of the pyloric segment of the stomach, in the remainder, the mucosa is irregularly thickened, and at one point, only to be seen with the microscope, there is the earliest visible stage of the invasion of the submucous and muscular coats, by a spheroidal-celled cancer. The fibromatosis is moderate in degree and its distribution closely corresponds to the ulcerated area in the mucosa. In another of our cases there is a punched-out ulcer about one inch from the pyloric ring, the floor of which consists of a mass of scar tissue replacing all the coats. At the edge of the ulcer, the scar tissue is being invaded by an extensive growth of cancer—a condition which is not appreciated by the naked eye—while beyond this there is a comparatively limited amount of fibromatosis.

In a fourth case there is an ulcer close to the pyloric ring, with marked fibromatosis both in the submucous and sub-

serous coats, and an early adenocarcinoma proceeding from the edge of the ulcer and invading the submucous and muscular coats

In the fifth case, for which we are indebted to Mr Cathcart, there is in the centre of the fibromatosed area a deeply punched-out ulcer, which has eaten through all the coats, we failed to find evidence of cancer in the different portions of stomach submitted to microscopical examination, but this was readily found in an enlarged lymph gland, embedded in the fat of the lesser omentum

The comment on this series of cases is that they all illustrate the same sequence of events. Following upon a chronic ulcer, attended with fibromatosis, there occurs an epithelial growth at the margin of the ulcer, and an invasion of the deeper coats of the stomach. It should be emphasized that, excepting the first of the five, there was nothing in the naked-eye appearance to suggest the presence of cancer.

*Pathogenesis of Gastric Fibromatosis*—Gastric fibromatosis, in view of its selective and spreading characters, suggests an analogy with the fibromatosis of nerves—neurofibromatosis—but the analogy goes no further, we have examined the stomach from a case of generalized neurofibromatosis in our own collection, and we find that the submucosa is not appreciably altered and that the fibromatosis mainly involves the nerves of the muscular and subserous coats.

We have not observed any features that would suggest the view advanced by some writers that the lesion is of syphilitic origin, there is no characteristic granulation tissue and there is an entire absence of endarteritis, and in the cases in which we have had an opportunity of employing the Wassermann reaction, the results have been negative. We do not mean to deny the occurrence of a gummatous lesion of the pyloric portion of the stomach, causing stenosis of the outlet, such as has been described by Bird of Melbourne (*B M J*, Oct., 1910), but we have not met with the condition.

We are also disinclined to accept the view that fibromatosis

is due to a tuberculous infection. We have had the opportunity of examining a specimen of Mr Caird's which presents a combination of tuberculosis and cancer, the tuberculous granulation tissue, which shows typical giant-celled systems, is most abundant in the subserous coat. The suggestion that fibromatosis represents an attenuated form of tuberculous infection, in the sense propounded by Poncet and other members of the Lyons School, is not supported by our observations.

The most widely accepted view regarding the nature of the thickening in the submucous coat, which we have called a fibromatosis, is, that it is really a form of atrophic infiltrating scirrhous carcinoma. We would like to point out that we are familiar with this form of cancer in the stomach, and we recognize also that it may cause a diffuse thickening of the submucosa, which, to the naked eye, may be indistinguishable from the condition we call fibromatosis. The investigation of our material, in the light of this knowledge enables us to affirm most positively that fibromatosis may occur without the presence of cancer.

*The Association of Fibromatosis with Ulcer or Ulceration of the Mucosa*—Having succeeded, as we believe, in establishing fibromatosis as an innocent affection of the stomach, we shall now consider the conditions under which it occurs. The most striking association is that which exists between fibromatosis and ulcer or ulceration of the mucosa.

The apparently invariable association of fibromatosis with ulcer or ulceration of the mucosa raises the question, is fibromatosis a primary change in the stomach or is it secondary to an antecedent lesion? We have never seen fibromatosis in a stomach that was otherwise normal. When fibromatosis is associated with a punched-out ulcer, the mucosa over the surrounding fibromatosis may be practically normal, this would appear to warrant the inference that submucous fibromatosis is not the cause of the changes in the overlying mucosa, but that these precede the fibromatosis and are probably related to it as cause and effect. In other words, the

changes in the mucosa are primary and the submucous fibromatosis is secondary

The lesion of the mucosa that is followed by fibromatosis is either a punched-out chronic ulcer or a chronic superficial ulceration, this naturally suggests that the necessary antecedent of fibromatosis is a breach of the surface, which permits of the access to the subjacent submucosa of a toxin or irritant, to which the tissue of the submucosa reacts, and the reaction takes the form of a diffuse, spreading, new formation of young fibrous tissue. The diffusion or spread of the fibromatosis in the submucosa, from its original seat of formation, its abrupt arrest at the pyloric ring, its extension mainly along the lesser curvature, its extension into the muscularis between the bundles of circularly disposed muscular fibres, all agree in supporting the view that the irritant which causes fibromatosis is conveyed from its entrance to the parts which react to it, by way of the lymphatics.

The capacity of spreading diffusely is one of the most suggestive features of fibromatosis, and is naturally one of the explanations of its having been regarded by many observers as an infective or malignant disease.

It is instructive to contrast fibromatosis with other forms of connective-tissue reactions resulting from irritants. It is obviously a form of "chronic inflammation," but it differs essentially from those which are familiarly known to us. Contrast it, for example, with the scar tissue in the fibre and margin of a chronic ulcer, scar tissue replaces the coats of the stomach, it shows no predilection for any one of them, it is confined to the immediate vicinity of the ulcer, and its naked-eye and microscopical appearances do not differ from those of scar tissue in any other tissue or organ of the body.

The same contrast holds good with the new formation of fibrous tissue, in response to irritation, seen, for example, in chronic lesions of the gall-bladder or of the urinary bladder. There may be great thickening and induration of the wall of either viscous, but there is no selective fibromatosis of any particular coat.

It is also instructive to contrast fibromatosis with the well-known forms of chronic interstitial fibrosis or cirrhosis which occur, for example, in the liver or kidney. In these, the new formation of fibrous tissue affects the whole connective tissue frame-work or stroma of the organ, and is diffuse from the outset, presumably because the irritant causing it is conveyed by the blood stream, in gastric fibromatosis, the new formation of fibrous tissue commences in the vicinity of a breach of surface in the mucosa, and selects the submucous coat, as if the irritant were slowly diffused along the lymphatics.

Considering the frequency of duodenal ulcer, it is remarkable that there is no record of fibromatosis similar to that met with in relation to gastric ulcer, this, together with the fact, that, duodenal ulcer is practically immune to the incidence of cancer, inclines us to conclude that there is some peculiarity in the pyloric portion of the stomach which renders it liable, both to ulcer-fibromatosis and to ulcer-cancer.

*Relationships of Fibromatosis to Cancer*—We have sufficiently elaborated the proposition that fibromatosis is not cancer, and we believe we have proved that it may occur apart from cancer. There remains, however, the very important observation, that the ulcer which is complicated by fibromatosis may also become the starting point of cancer, and we have been able to record the details of five cases which illustrate this combination of lesions. Our observations suggest, that the ulcer is the primary lesion, that the ulcer is followed by fibromatosis, and that, finally, a cancer originates at the edge of the ulcer. The epithelial proliferation, being walled in by the dense scar tissue around the ulcer, and by the scarcely less dense fibromatosis in the surrounding submucosa, is greatly hindered and makes little headway, so little that it is difficult to recognize it except on careful microscopic examination. Cancer cells escape into the lymphatic, from time to time and, when they have reached the adjacent lymph glands, are identified in these more easily than in the primary focus.

The type of cancer is either an adenocarcinoma or a spheroidal-celled cancer.

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The type of cancer is either an adenocarcinoma or a spheroidal-celled cancer.

*Clinical Features of Ulcer-Fibromatosis*—Inasmuch as fibromatosis is always a sequel of peptic ulcer or ulceration the clinical features are practically those of ulcer, and they are influenced to a greater degree by the seat of the ulcer than by its association with fibromatosis. In the exceptional cases, in which the pylorus is not involved the symptoms are inconclusive, indigestion and epigastric pain of some months duration, such as would not have suggested operative interference but for the recognition of a palpable tumor, which was diagnosed as cancer.

In the cases, in which the pylorus was involved, the symptoms were those of pyloric obstruction, and as in the majority there was an absence of free hydrochloric acid, along with a palpable tumor, the diagnosis of cancer was made with confidence. Hemorrhage was a prominent feature in only one case, although there was an ulcer or ulceration in all the cases. The discovery of a tumor in the epigastrium, sometimes made by the patient, occurred in a larger percentage of the cases than is usual in cases of ulcer uncomplicated by fibromatosis. The sexes were affected in approximately equal proportion.

*The Recognition of the Nature of the Tumor When Exposed by Operation*—In the great majority of cases in which the abdomen is opened and a tumor of the pyloric segment of the stomach is rendered available for examination, it is possible to make a reliable diagnosis as to its nature. The clinical history, the tests of the gastric functions, and the radiographic appearances, together with what one can see and feel, will enable the operator to come to a decision as to the nature of the lesion. And yet, with all these data to go upon, the operator has been wrong in his decision in no less than nine of the cases recorded in this paper. It is easy, in the light of after events, to explain these diagnostic errors. The operator has been led to expect the existence of a pyloric carcinoma, on opening the abdomen, he finds a tumor involving the pylorus, obstructing the pyloric outlet, spreading

along the lesser curvatures, and associated with enlargement of the lymph glands in the lesser omentum. He naturally regards the diagnosis of carcinoma as confirmed, and he proceeds to resect the stomach. Supposing, however, the operator has been deceived in previous cases and insists on immediate microscopical examination of a portion of the tumor or of one of the enlarged glands. The examination of one of the lymph glands is the most easily carried out and also, the most instructive. If it is found to show cancer, no further doubt is possible, but, and this is our point, if cancer is not found, the question is by no means solved. A positive result is conclusive, but a negative one is of little value. The more we have studied this question of immediate microscopical examination the less are we prepared to rely upon it. In several of our specimens we have been obliged to cut sections from different parts of the tumor and from several of the enlarged glands related to it, and instead of the few minutes implied in the term "immediate microscopical examination," prolonged and repeated efforts were required before the question of innocence or malignancy could be decided with any approach to certainty. The suggestion that a surgeon should delay the important steps of the operation until he has been informed of the results of the histological investigation conveys a confidence in rapid microscopical diagnosis which we regret we are unable to share.

Inspection of the interior of the stomach may help in a limited proportion of doubtful cases. A projecting cauliflower growth, for example, establishes the diagnosis of cancer, the absence of such a growth, however, does not exclude cancer. The discovery of a chronic ulcer, without infection of glands, would justify the operator in performing a limited resection instead of the radical operation for cancer.

*Operative Treatment of Gastric Fibromatosis*—If we suppose that the condition has been correctly diagnosed and that the existence of cancer has been excluded, we advise that the affected portion of the stomach should be resected, because of the undoubted risk of cancer supervening.

Suppose, further, that it has not been possible to exclude the presence of cancer, and we believe that this is a more common condition of affairs, then again, we say resect. A reasonable alternative, and one we have ourselves practised, especially in weakly patients, is to perform a gastro-enterostomy and at the same time remove several of the enlarged glands from the lesser curvature. If these show the presence of cancer, the resection should be carried out after a suitable interval for recuperation. Further, if the disease, not diagnosed with certainty either as cancer or ulcer-fibromatosis, does not lend itself to radical operation, then relief to the symptoms should be afforded by gastro-enterostomy, and, if this is impracticable, by jejunostomy. Eiselsberg records a case of fibromatosis of the pyloric segment, treated by jejunostomy and the patient was in good health six years after the operation.

*The Diffuse Form of Gastric Fibromatosis or "Leather-Bottle" Stomach*.—In the classified work by Brinton on diseases of the stomach, it is taken for granted, that the diffuse form of the lesions, is, like the localized variety, innocent in character. We confess that at first we shared this opinion but we are now convinced of the unreliability of our observations owing to the imperfect preservation of the specimens of "leather-bottle" stomach in the University Museum. We have only been able to examine (and that owing to the kindness of Dr Drennan) one first specimen of the lesion, sections taken from different parts of the stomach and from the glands, show a diffuse form of carcinoma.

We do not think the observations recorded up to now are sufficient to decide the question. We think it is probable that an innocent form of "leather-bottle" stomach does occur, we are not surprised, however, that it is rare, because the spread of the disease throughout the stomach affords ample time for the superaddition of cancer and because the patient is liable to succumb to the localized form of the disease before it has had time to become diffused, or he is relieved of it by the surgeon.

# DIAGNOSIS AND TREATMENT OF FRACTURES INVOLVING THE KNEE-JOINT.

INCLUDING EPIPHYSEAL SEPARATION

BY JOHN BAPST BLAKE, M.D.,

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WE have for consideration lesions affecting three bones,—the patella, the tibia and femur

THE PATELLA—*Number*—In 1906, Dr David Scannell published a valuable paper upon compound fracture of the patella,<sup>1</sup> which included a tabulation of all fractures in the Boston City Hospital in forty-two years. According to this tabulation there were during this period 38,627 fractures of all kinds, of which 660 were closed and 8 open (compound) fractures of the patella. A careful examination of the records from January, 1906, to May 1, 1913, reveals 211 simple and 3 open patella fractures in addition, so that from May 24, 1864, to January 1, 1913, there have been a total of 871 simple, and 11 open fractures of the patella treated at the Boston City Hospital.

*Frequency*—Scannell compared his figures with those of Gurlt (Hamburg, 1862) who reported 51,938 fractures from London hospitals. This author found that fracture of patella constituted 1.27 per cent of all fractures. Stimson, 1912, in 14,566 fractures at the Hudson Street Hospital, New York City, found 183 fractures of the patella, or 1.26 per cent. Scannell found the per cent to be 1.9 per cent and it is probable that the relative frequency of this fracture has slowly increased, so that it now forms distinctly more than 2 per cent.

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\* Read before the American Surgical Association, May 6, 1913.

<sup>1</sup> Comp fract patella Report of unusual case Tabulation of all fractures in Boston City Hospital in 42 years David D Scannell, M.D., Boston Med and Surg Jour, Nov 15, 1906

of the fractures occurring in Boston, and presumably throughout the United States

*Etiology*—More and more has it become evident that the cause of this fracture is muscular, or indirect violence, in the large majority of cases. The fact that only 11 of 882 cases were open fractures argues strongly for this view, because it is highly improbable that if direct violence were the frequent cause, open fractures would be so rare (but little more than 1 per cent of all patella fractures). The writer has been impressed by the fact that the amount of muscular violence required to fracture the patella may be apparently slight, and it may be part of some action habitually performed by a healthy man. For instance (personal knowledge), three cases have occurred in athletes in the customary preliminary effort of turning a somersault. A majority of patients, however, believe that the patella is broken by the direct violence of the fall, and only by careful questioning is the accurate history obtained.

*Symptoms*—Muscular violence of course produces the transverse or tear fracture, with considerable separation of fragments, indirect violence results in the comminuted or multiple fracture, often with little, occasionally (if a strong prepatellar bursa remains intact) with no separation. In this latter class of cases mistakes may be made, since the typical signs, including crepitus, separation of fragments, loss of function, may be absent. One sign, however, is always present, an increase in the intra-articular fluid, either synovia or blood or both, obliterating the normal hollows or dimples of the joint. In any acute traumatic synovitis, therefore, fracture of patella should be suspected, and positively ruled out before establishing treatment and giving prognosis.

*Treatment*—Of 418 cases treated since 1895, 245 have been operated upon and 173 treated expectantly. The percentages of cases subjected to operation grows rapidly in recent years. 13 cases were admitted from January 1 to May 1, 1913, and every one has been sutured. In the early years, drilling the fragments and wiring was the routine pro-

cedure At present, though details vary with the large number of surgeons, suture with catgut or kangaroo is the rule In the records of fifteen and twenty years ago there are frequent references to secondary operation for the removal of wire, though the results on the whole were very good, patients were kept in the hospital almost twice as long as at present, in 1895 and 1896 the duration of hospital treatment was from six to ten weeks, at present it is less than half as long

*Refracture*—Since 1895, only seven cases of refracture have been found in the records, and four of these are within the past year, the other being much earlier Unquestionably the tendency to limit the stay in the hospital has diminished the enforced idleness of the patient, but undoubtedly the present tendency is to let the patients leave the hospital a little too early A sutured patella will not stand a sudden strain four weeks after the operation and refracture will inevitably occur in a certain number of cases, if patients are discharged under conditions which favor carelessness and permit accident

In one of the four recent refractures, the condition was open, though sustained seven weeks after the original operation Precise conclusions as to liability of refracture in operated as compared with non-operated cases are not possible, since the number is too small, but the writer believes that the chance is about an even one, the operated cases being, perhaps, a trifle more liable to refracture In a series of cases reported in England some years ago, the conclusion drawn was that bony union in fracture of the patella does not lessen the chance of refracture, and bony union occurs only as a result of operation, except in very rare instances

*Death*—It was a surprise to find that there were no less than six deaths due either to delirium tremens (4) or to pneumonia (2) in the series of 418 cases since 1895 Of these one died of pneumonia after operation, one of delirium tremens after operation (the writer's case) The four others were treated without operation, one died of pneumonia and

three of delirium tremens Still another patient developed severe and long-continued delirium tremens while in the hospital, but eventually recovered There were two deaths from causes other than these, so that the total mortality was 8 in 418 cases, or nearly 2 per cent

The writer's fatal case above mentioned was a middle-aged sailor noted to be nervous and tremulous at entrance His condition improved, and seemed normal on the tenth day, when suture was performed Immediately tremor returned and again disappeared, only to develop once more on the tenth day after operation The wound was clean, the joint normal, and the skin sutures had been removed; he passed into stupor and died five days later Autopsy was not permitted This death is not to be attributed to the operation for fracture of the patella, but to a mistake in surgical judgment in instituting any surgical procedure of whatever nature It is possible that the man would have died even without operation, as did the four others

The writer, in common with many others, has passed through the period of drilling fragments, and using wire Since the publication of Dr Joseph Blake's paper in 1904, however, his classification and technic have been adopted and modified little if at all The treatment is based upon the assumption that the condition is more a rupture of a tendon and a joint capsule than a fracture of a bone In the writer's own series of some thirty cases, operation has been performed on the seventh to tenth day Preliminary injection of the joint practised by Dr Murphy has not been done, the tear in the lateral capsule is closed with interrupted sutures of No 2 plain catgut, after all clots have been removed from the joint, using for this purpose instruments, not gauze, the torn periosteum is lifted from between the patellar fragments and sutured across the line of fracture, after a half purse string suture placed at either side of the patella has closely approximated the fragments, silkworm gut sutures close the skin tightly, and without drainage, a padded ham splint is applied, and the leg elevated, stitches removed from the skin on the

tenth to twelfth day. At the end of two weeks gentle lateral motion of the patella is made, passive flexion of knee through a small arc in three weeks, gentle active motion of knee in four to five weeks; patient discharged in four to six weeks, to wear splint until eight weeks after the operation. It is expected that if these directions are carefully followed, the patient should be at work in or within three months, with a strong knee and from 60 to 90 degrees flexion.

In one case a much less satisfactory result is known to have followed operation, because the patient, a very nervous young woman, could not be made to bend her knee or use her leg, at three months she had less than 20 degrees flexion; she then accidentally struck the knee against a sharp object, and fearing refracture, again refused to use it. At length, after active massage was insisted upon and vigorously instituted, she began to gain and when last seen had about 50 degrees flexion and a useful leg. Such unwillingness to bend the knee, a not infrequent occurrence, is one of the most effective causes of inadequate results, and is not easy to overcome; it emphasizes the importance of careful treatment after the patient has left the wards, a thing not always easy to compel in the careless modern city dwellers.

*Open Fractures*—Of the eleven cases since 1864, eight reported by Scannell and three since his publication, only four (Scannell 1, Blake 1) have been entirely without infection, two were slightly and superficially infected; three moderately, though not harmfully infected, and two seriously infected. One of the very early cases (1889) died of delirium tremens two weeks after operation (this is not included in the cases of death described above).

One of the writer's two cases of refracture was open, the patient celebrated his discharge by getting drunk, seven weeks after the original operation, he fell down stairs; was brought to the hospital with the wound torn wide open, the fragments separated at least three-quarters of an inch, and the joint full of blood clot and dirt. The skin was scrubbed and cleansed with excessive thoroughness, and the joint irrigated

with gallons of hot salt solution, the capsule then closed as at the previous operation, and the skin sutured tightly. The convalescence was absolutely normal without the slightest rise of pulse or temperature. The result at the time of discharge from the hospital was as good as that of the closed fractures after operation, and this is true of the other open fractures in which there was little or no suppuration.

#### EPIPHYSEAL SEPARATION OF (*a*) FEMUR, (*b*) TIBIA

(*a*) *Femur*—Drs Binney and Lund have just finished a careful and complete paper, based upon a study of all cases of separation of the lower epiphysis of the femur recorded in the Boston City Hospital since 1898. The paper is about to be published and the authors have kindly permitted me to summarize some of their findings.

Eighteen cases, from six to nineteen years of age, were admitted to the hospital since 1898. Of these, 13 were simple, and 5 open or compound; hyperextension was the cause in almost every instance, the exceptions being direct violence; 14 were injured in wagon accidents, no less than 7 having the leg caught in the spokes of the revolving wheel, the deformity varied from a very slight, to an extreme degree, in one case the diaphysis projecting four inches through the popliteal space. In 16 cases the epiphysis was moved forward, in two the displacement was lateral. In a majority of instances the reduction of deformity was easily accomplished under ether, in 6 cases the reduction was either difficult, or recurred, requiring repeated manipulations, in 2 cases, serious deformity persisted in spite of every effort, one case (open) came to amputation on account of interference with the circulation by pressure of lower end of diaphysis upon the vessels, one (open) was complicated by infection with gas bacillus, the leg being saved but with poor result owing to recurring forward displacement of the epiphysis. In one the recurring deformity was overcome by open operation and fixation with a wire nail driven through the external condyle into the

epiphysis, with a perfect result. The method of maintaining position after reduction was (1) simple fixation on ham splint or in plaster, (2) fixation in moderate, occasionally in extreme, flexion Operation (a) suture of periosteum; (b) fixation by nail.

Screws, plates, and mechanical devices are reported to have been used by others, but it is obvious that they should be avoided except as an absolutely last resort, and should always be removed as soon as union is firm The results at the time of leaving the hospital were remarkably good, considering the severity of the conditions, position must of course be controlled by frequent X-rays, the knee-joint was, apparently, not permanently affected in any of the cases

While examining the records I have found two additional cases of separation of the femoral epiphysis, in which the index diagnosis was misleading, one complicated a very severe fracture of the midshaft of femur, in a boy of twelve, in this instance the displacement was slight and the ultimate result good The second was at first considered a fracture, but careful X-rays showed it to be a dislocated epiphysis, in front of femur Three efforts at manual reduction were ineffective, and open operation was necessary This makes a total of twenty of these cases

(b) *Separation of Upper Epiphysis of Tibia*—This condition, recognized and described as a separate entity, is found only twice in the City Hospital Records It seemed inexplicable to the writer, until he was informed by Dr James Stone, that not a single instance is recorded in the Records of the Boston Children's Hospital Conversation with other surgeons lends authority to the statement that separation of this epiphysis is extremely rare indeed, apparently violence which might be expected to produce it, in reality acts upon the lower end of the femur and its epiphysis, the tibia remaining uninjured, unless a true fracture results In the two cases treated at the City Hospital the displacement was slight, and fixation gave excellent results While examining X-ray plates of the knee, the writer discovered two previously unrecognized

cases of the condition first described by Osgood, of Boston, in 1903,<sup>2</sup> and now called the Osgood-Schlatter disease. It is a partial or complete separation of the tubercle of the tibia, occurring in youth. Osgood points out that while the upper tibial epiphysis includes in an anterior lip the tubercle of the tibia, the latter sometimes has a separate centre of ossification, the patella tendon inserts into this tubercle, though the tendon has accessory lateral bands going to the sides of tibia. The first pull of the powerful quadratus femoris muscle, however, is delivered upon the tubercle, and at times separates it completely, at times lifts the lower extremity partially away from the shaft. The two Boston City Hospital cases occurred in boys of 11 and 14 years and were said to be due to a fall or the effort to prevent a fall. There was local tenderness and the question of incipient bone disease, or of a fracture. The degree of separation was slight, but taken in connection with the history and symptoms, leaves little doubt of the character of the lesion. Rest and fixation are indicated, operation is very rarely needed, and results are good.

The records also contain four cases of epiphysitis of the head of the tibia, in which trauma apparently played a part. It is possible that a separation may have been the original condition in some of these. One suppurated, and was operated, but eventually died, a second was operated and recovered, the others recovered without operation.

(c) *Fracture of the Head of the Tibia into the Joint*—This lesion is much more common than the separation of the corresponding epiphysis, but less common than a corresponding fracture of the lower end of the femur.

A recent law suit in Massachusetts called attention to the fact that this high fracture of the tibia may easily be overlooked by excellent general practitioners. In the case in question the injury, a fall from a step ladder, was treated as a severe contusion and sprain of the knee. Limitation of motion, together with continued swelling and tenderness of

<sup>2</sup> Lesions of the tibial tubercle occurring during adolescence Robert B Osgood. Boston Med and Surg Jour, Jan 29, 1903

the joint, caused the patient after some weeks to go to a hospital, where the X-ray showed a fracture of the outer tuberosity of the tibia, united in fairly good position. Whether a better result could have been obtained if the diagnosis was correctly made in the beginning, is an open question. In the past year two cases have been admitted to the writer's service as rupture of the internal lateral ligaments of the knee, in both of which a fracture of the inner tuberosity could be determined by careful examination, crepitus was not obtained, but slight mobility and exquisite tenderness below the insertion of the lateral ligament made the diagnosis probable before confirmation by the X-ray. Just as the sprain-fracture at the ankle-joint is more frequent than was formerly supposed, so the rupture of the lateral knee ligament is very apt to carry with it a larger or smaller fragment of the head of the tibia. Repeated X-rays are necessary to rule out such a fracture in cases where it may be suspected.

The question of massage and early motion are naturally influenced by such a condition, and the prognosis as to complete motion must be more guarded. As a rule reduction under ether, fixation, and appropriate padding will maintain good position, but it may occasionally be necessary to use a wire nail or to insert a plate, this is a less serious procedure than in the corresponding fractures of the femur, since a small plate might be inserted without necessarily invading the knee-joint. Dr Lund succeeded in getting an excellent result by the use of a wire nail in a case of fracture of the internal condyle of the tibia with partial dislocation of the lower leg. Repeated attempts to maintain position of the broken tuberosity were unavailing, until the nail was inserted. The result was excellent.

A careful examination of the records of the last three years reveals eighteen cases of very high fracture of the tibia into the knee-joint. The etiology is in the majority of instances a fall striking at the point of fracture, though in one instance it was a crush between logs, and in another it is said to have occurred (together with a high fracture of the fibula).

by a sudden twist resulting from an attempt to board a rapidly moving trolley car, a most unusual example of a torsion fracture. In about one-half the cases, the correct diagnosis was not made even in the hospital until X-ray plates were taken, and these at times revealed fractures of one or other tuberosities without displacement. One case had been considered by an excellent surgeon as a dislocated internal semi-lunar cartilage. In three of the eighteen cases one or more vertical median fissures existed, constituting fracture of both tuberosities, one case was open, with a triangular bit broken from the front of the tibia.

Marked synovitis is recorded only a few times, and the results at the time of discharge were unexpectedly good, though the arc of motion is not always given. The compound fracture suppurrated and was repeatedly operated, leaving a knee with much diminished power of flexion.

*Supracondyloid Fracture of Femur*—In the records from 1877 to 1891, twenty-seven cases are noted as "fracture of femur at knee." Of these one had a coincident fracture of the patella, one was a fracture of the external condyle, two of the internal condyle and one a T-fracture. One died on the day after entrance and a second after an amputation of the thigh. The others were discharged either "well," or "relieved." There were no X-rays in this series.

For the three years previous to 1913, there were admitted twenty cases in which fracture of the lower end of the femur invaded the knee-joint. Of these two were open, one of these had other injuries, and the patient was in profound shock, gas bacillus infection developed, followed by pneumonia, and the patient died on the fifth day. The second was in a child of four years, with very extensive lesions of the soft parts, sepsis developed, amputation was recommended and refused for three days, hip-joint amputation was finally done, but death occurred five days later. One case of simple fracture died in five days, but this was also complicated by other injuries.

The term supracondyloid fracture of femur is elastic

As a rule it is used to mean fracture below the lower third of the shaft. It is often oblique, and a majority of oblique supracondyloid fractures involve the knee-joint, either directly, or through the subcruræus bursa. The deformity is almost invariably of lower fragment backward, and this is maintained by interposition of soft parts, and pull of calf muscles. In the vast majority of cases hyperextension, or the carrying forward of the extended leg, the thigh being fixed, will produce separation of the epiphysis in the young, and supracondyloid fracture in the adult.

In the twenty cases of this series, one only showed a forward displacement in an adult. There was a single case in a boy of eleven years, which gave every clinical symptom of a separated epiphysis, the X-ray, however, showed a fracture of the shaft a scant inch above the epiphysis with an angular (30 degrees) displacement forward from this point. This is the only case found in which history of accident, and clinical signs in a child, pointed directly to epiphyseal separation, and yet a fracture was demonstrated as the actual lesion. There was also one fracture three inches above the condyles in a boy, with lower fragment posterior, this being the only instance of the adult type of supracondyloid fracture in a child.

*Treatment*.—Five of the twenty cases were treated by open operation; once the lower fragment was pried into place, and remained in fair position, once it was wired, with a fair result, three times Lane's plates were used with moderately good results. The other cases were treated either by direct extension, or extension and the double inclined plane, in one the leg was held at right angles, for the first two weeks, as this seemed to keep the lower fragment from displacement.

The indications for operation have seemed to be, marked and persistent deformity, danger of weak union, and rotation of condyles by backward displacement of upper and of lower fragment, so that flexion of knee may be seriously limited. Men differ widely upon the degree of these elements which makes operation imperative. certain cases of extreme comminution of supracondyloid shaft which refuse operation

obtain unexpectedly good results (one such case is at present in the wards), and at times operation does not accomplish what seems fair to expect. On the whole, open operation for supracondyloid fractures will probably be a little more frequent in the future than in the past. But, as in all other localities, non-operative methods should have most thorough and thoughtful consideration before being discarded.

The diagnosis rests ultimately upon the X-ray but may be made clinically more and more accurate by continued thought and care.

#### CONCLUSIONS

First, the five principal traumatic bone lesions involving directly or indirectly the knee are influenced less than might be expected by the fact that they invade the largest joint in the body.

Second, trauma affecting the knee-joint, if sufficient to produce fracture, causes fracture of patella most frequently, of femur next in order, and of tibia least often, in patients under 20 years such trauma usually causes separation of the lower femoral epiphysis.

Third, with the exception of sepsis, the other complications added to fractures in this region are *a* Greater difficulty in maintaining position of fragments, *b* greater limitation of motion after union has taken place; *c* in certain operative cases, an added danger, that of invading a joint with a solid body.

Fourth, the indications for treatment are similar to those applicable to other fractures except that non-absorbable materials should not be used within the limits of the knee-joint unless it is absolutely unavoidable, and the immobilization be practised for a period longer than is advisable in fractures not involving joint cavities.

# AN ANALYSIS AND STUDY OF 724 MAJOR AMPUTATIONS.

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IN 1894 the writer published a paper entitled "A Contribution to the Study of Modern Amputations" (*Medical Record*, Nov 3, 1894). This paper tabulated 340 major amputations performed at the writer's clinic in St Luke's Hospital

The present paper adds 384 major amputations, all taken from this clinic, and combines the two lists, thus presenting for study 724 major amputations

The list published in 1894 is as follows

Single Major Amputations	No of operations	Deaths	Mortality percentages
Amputation of arm	27	1	3 70
Amputations of forearm	37	0	0
Amputations at shoulder-joint	13	1	7 69
Amputations of foot, Chopart's	7	0	0
Amputations of foot, Hay's	2	0	0
Amputation of foot, Pirogoff's	1	0	0
Amputations of foot, Syme's	9	0	0
Amputations of leg, lower third	47	1	2 12
Amputations of leg, middle third	28	0	0
Amputations of leg, upper third	22	1	4 50
Amputations of thigh, lower third	44	5	11 36
Amputations of thigh, middle third	25	2	8 00
Amputations of thigh, upper third	8	1	12 50
Amputations at knee-joint	17	1	5 88
Amputations at hip-joint	7	1	14 28
Total .	294	14	4 76

## Synchronous Double Major Operations

Amputation at the shoulder-joint, and the other arm, lower third .	1	0	0
Amputation at shoulder-joint and the other arm, middle third	2	0	0

\* Read before the American Surgical Association, May 6, 1913

Synchronous Double Major Operations	No of operations	Deaths	Mortality percent ages
Amputation at shoulder-joint, and the other forearm, middle third . . . . .	I	0	0
Amputation at shoulder-joint, and a leg, lower third . . . . .	I	0	0
Amputation at shoulder-joint, and operation for compound depressed fracture of the cranium . . . . .	I	0	0
Amputation of both arms . . . . .	I	I	100
Amputation of arm, upper third, and leg, middle third . . . . .	I	0	0
Amputation of arm, lower third, and forearm, middle third . . . . .	I	0	0
Amputation of both forearms . . . . .	I	0	0
Amputation of both feet, Chopart's . . . . .	2	0	0
Amputation of both feet, Hay's . . . . .	2	0	0
Amputation of one foot, Chopart's, and other leg, lower third . . . . .	I	0	0
Amputation of one foot, Syme's, and other leg, lower third . . . . .	2	0	0
Amputation of both legs . . . . .	7	3	428
Amputation at knee-joint, and other leg, lower third . . . . .	I	0	0
Amputation at knee-joint, and other leg, middle third . . . . .	I	0	0
Amputation at knee-joint, and other thigh, lower third . . . . .	I	I	100
Amputation of one leg, lower third, and excision of the other ankle-joint . . . . .	I	0	0
Amputation of one leg, lower third, and other thigh, lower third . . . . .	2	2	100
Amputation of one leg, upper third, and other thigh, lower third . . . . .	I	0	0
Amputation of one leg, middle third, and other thigh, lower third . . . . .	2	I	50
Amputation of both thighs, lower third . . . . .	2	0	0
Amputation of both thighs, middle third . . . . .	I	I	100
Amputation of one thigh, middle third, and all the toes of the other foot . . . . .	I	0	0
Amputation of one thigh, lower third, and operation for removing fragments and apposing and draining compound fracture of the other leg . . . . .	I	0	0
Total . . . . .	38	9	23.68

## Synchronous Triple Amputations

Amputation of thigh, lower third, left arm, lower  
third, and half right hand . . . . . 1 0 0

# MAJOR AMPUTATIONS

41

Synchronous Triple Amputations	No of operations	Deaths	Mortality percentages
Amputation of thigh, lower third, leg, middle third, arm, upper third	2	2	100
Total	3	2	66 6
<b>Synchronous Triple Mixed Operations</b>			
Amputation of thigh, lower third, leg, lower third, and closing and draining extensive lacerations of the scalp	1	0	0
Amputation of thigh, lower third, arm, middle third, and closing and draining extensive laceration of scalp	1	1*	100
Amputation of left thigh, middle third, right foot, (Syme's), removal of fragments, apposition and draining of compound comminuted fracture of right humerus	1	0	0
Amputation of both thighs, middle third, and closing and draining extensive laceration of scalp	1	1	100
Total	4	2	50 00

## Quadruple Mixed Operation

Amputation of thigh, lower third, leg, middle third, half of palm of the hand, and closing and draining extensive laceration of scalp and forearm	1	0	0
Total	1	0	0

The added list is as follows

Single Major Amputations	No of operations	Deaths	Mortality percentages
Amputation of arm	35	0	0
Amputation of elbow-joint	3	0	0
Amputation of forearm	19	0	0
Amputation of foot, Chopart's	8	0	0
Amputations of foot, Hay's	19	0	0
Amputations of foot, Pirogoff's	2	0	0
Amputations of foot, Syme's	11	0	0
Amputation of foot, Lisfranc	1	0	0
Amputations of foot, Mickulicz	2	0	0
Amputations at knee-joint	16	0	0
Amputations of leg, lower third	58	0	0
Amputations of leg, middle third	30	0	0

\* Died of cerebritis produced by the injury to head

## WILLIAM LAWRENCE ESTES

Synchronous Double Major Operations	No of operations	Deaths	Mortality percent ages
Amputation at shoulder-joint, and the other forearm, middle third	1	0	0
Amputation at shoulder-joint, and a leg, lower third	1	0	0
Amputation at shoulder-joint, and operation for compound depressed fracture of the cranium	1	0	0
Amputation of both arms	1	1	100
Amputation of arm, upper third, and leg, middle third	1	0	0
Amputation of arm, lower third, and forearm, middle third	1	0	0
Amputation of both forearms	1	0	0
Amputation of both feet, Chopart's	2	0	0
Amputation of both feet, Hay's	2	0	0
Amputation of one foot, Chopart's, and other leg, lower third	1	0	0
Amputation of one foot, Syme's, and other leg, lower third	2	0	0
Amputation of both legs	7	3	42.8
Amputation at knee-joint, and other leg, lower third	1	0	0
Amputation at knee-joint, and other leg, middle third	1	0	0
Amputation at knee-joint, and other thigh, lower third	1	1	100
Amputation of one leg, lower third, and excision of the other ankle-joint	1	0	0
Amputation of one leg, lower third, and other thigh, lower third	2	2	100
Amputation of one leg, upper third, and other thigh, lower third	1	0	0
Amputation of one leg, middle third, and other thigh, lower third	2	1	50
Amputation of both thighs, lower third	2	0	0
Amputation of both thighs, middle third	1	1	100
Amputation of one thigh, middle third, and all the toes of the other foot	1	0	0
Amputation of one thigh, lower third, and operation for removing fragments and apposing and draining compound fracture of the other leg	1	0	0
Total	38	9	23.68

## Synchronous Triple Amputations

Amputation of thigh, lower third, left arm, lower third, and half of right hand	.	1	0	0
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## MAJOR AMPUTATIONS

43

Synchronous Double Major Amputations	No of operations	Deaths	Mortality percentages
Amputation of both thighs, one middle third, and the other lower third . .	2	0	0
Amputation of both thighs, middle third	3	1	33 1/3
Amputation of thigh, upper third, and arm, upper third	1	1	100
<b>Total .</b>	<b>36</b>	<b>3</b>	<b>8 33</b>

## Synchronous Double Mixed Operations

Amputation of forearm, middle third, and operation for drainage and suturing laceration of leg	1	0	0
Amputation at shoulder-joint and operation for laceration of a leg and fracture of the femur	1	0	0
Amputation at shoulder-joint, ligation of the subclavian vessels, and exsections of portions of the clavicle and the acromion process of scapula for crush of the upper extremity	5	1*	20
Amputation of foot (Hay's), and operation for compound comminuted depressed fracture of the cranium	1	0	0
Amputation of leg, middle third, and operation for compound comminuted fracture of humerus	1	0	0
Amputation of leg, middle third, and operation for drainage and relief of extensive contusion of the other leg	1	0	0
Amputation of leg, upper third, and operation for closure and drainage of extensive lacerations of hand, and compound fracture of metacarpal bone of the thumb	1	0	0
Amputation at knee-joint, right side, and operation for removing fragments, controlling hemorrhage and drainage for compound comminuted fracture of left femur	1	1	100
Amputation of thigh, lower third, and operation for extensive laceration of the foot on the other side	1	0	0
Amputation of thigh, lower third, and operation for compound depressed fracture of the skull	1	0	0
Amputation of thigh, lower third, and operation for removing fragments and drainage of crushed foot	1	0	0
Amputation of leg, lower third, and operation for exploration and drainage of extensive laceration of the perineum .	1	0	0

\*Hopeless

## WILLIAM LAWRENCE ESTES

Single Major Amputations	No of operations	Deaths	Mortality percentages
Amputations of leg, upper third	7	0	0
Amputations at shoulder-joint	23	1	4.34
Amputations of thigh, lower third	59	3	5.8
Amputations of thigh, middle third	19	5	26.31
Amputations of thigh, upper third	7	2	28.57
Amputations at hip-joint	3	3	100
<b>Total</b>	<b>322</b>	<b>14</b>	<b>4.34</b>

## Synchronous Double Major Amputations

Amputation of right arm, lower third, and forearm, lower third	1	0	0
Amputation of arm, upper third, and leg, middle third	1	0	0
Amputation at shoulder-joint, and lower third of thigh	2	0	0
Amputation of both feet, Hay's	1	0	0
Amputation of right leg, lower third, and Syme's amputation of left foot	2	0	0
Amputation of both legs, one lower third, and other middle third	1	0	0
Amputation of right leg, middle third, and Syme's amputation left foot	2	0	0
Amputation of leg, lower third, and arm, upper third	1	0	0
Amputation of leg, middle third and arm, lower third	1	1	100
Amputation of both legs, middle third	2	0	0
Amputation of right leg, upper third, and left foot through the metatarsus	1	0	0
Amputation of both legs, one at the knee-joint, the other middle third	1	0	0
Amputations at both knee-joints	2	0	0
Amputation at knee-joint, and leg, lower third	1	0	0
Amputation of thigh, lower third, and portion of one hand	1	0	0
Amputation of thigh, lower third, and arm, lower third	2	0	0
Amputation of thigh, lower third, and leg, lower third	1	0	0
Amputation of thigh, lower third, and leg, middle third	3	0	0
Amputation of thigh, middle third, and leg, lower third	2	0	0
Amputation of thigh, middle third, and leg, middle third	1	0	0

Synchronous Double Major Amputations	No of operations	Deaths	Mortality percentages
Amputation of both thighs, one middle third, and the other lower third . . .	2	0	0
Amputation of both thighs, middle third .	3	1	33 1/3
Amputation of thigh, upper third, and arm, upper third	1	1	100
<b>Total</b>	<b>36</b>	<b>3</b>	<b>8.33</b>

## Synchronous Double Mixed Operations

Amputation of forearm, middle third, and operation for drainage and suturing laceration of leg .	1	0	0
Amputation at shoulder-joint and operation for laceration of a leg and fracture of the femur	1	0	0
Amputation at shoulder-joint, ligation of the subclavian vessels, and excisions of portions of the clavicle and the acromion process of scapula for crush of the upper extremity	5	1*	20
Amputation of foot (Hay's), and operation for compound comminuted depressed fracture of the cranium . . .	1	0	0
Amputation of leg, middle third, and operation for compound comminuted fracture of humerus	1	0	0
Amputation of leg, middle third, and operation for drainage and relief of extensive contusion of the other leg	1	0	0
Amputation of leg, upper third, and operation for closure and drainage of extensive lacerations of hand, and compound fracture of metacarpal bone of the thumb	1	0	0
Amputation at knee-joint, right side, and operation for removing fragments, controlling hemorrhage and drainage for compound comminuted fracture of left femur	1	1	100
Amputation of thigh, lower third, and operation for extensive laceration of the foot on the other side	1	0	0
Amputation of thigh, lower third, and operation for compound depressed fracture of the skull	1	0	0
Amputation of thigh, lower third, and operation for removing fragments and drainage of crushed foot	1	0	0
Amputation of leg, lower third, and operation for exploration and drainage of extensive laceration of the perineum	1	0	0

\* Hopeless

## WILLIAM LAWRENCE ESTES.

Synchronous Double Mixed Operations	No of operations	Deaths	Mortality percentages
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Amputation of thigh, middle third, and operation for drainage and suture of laceration of the other leg . . . . . 1 0 0

Amputation of thigh, upper third, and wiring compound fracture of radius 1 1 100

Total . . . . . 18 3 16.66

## Synchronous Triple Amputations

Amputation at left shoulder-joint, middle third right thigh, and Chopart's amputation left foot 1 0 0

Amputation of both thighs, middle third, and arm, upper third 1 0 0

Total . . . . . 2 0 0

## Synchronous Triple Mixed Amputation and Operations

Amputation of leg, lower third, thigh, lower third, and operation for compound comminuted depressed fracture of the cranium 1 0 0

Amputation of both forearms, middle third, and operation for compound fracture of leg and multiple lacerations of scalp 1 0 0

Amputation at knee-joint, left side, amputation of right foot, and operation for reduction of dislocation and fracture of femur . . . . . 1 0 0

Amputation of thigh, lower third, leg, lower third, and reducing dislocation of hip-joint 1 0 0

Amputation of thigh, lower third, reduction of upward dislocation of hip-joint of other side, and suturing lacerations of leg 1 0 0

Amputation of one leg at knee-joint, plating femur on same side for fracture, and wiring compound fracture of the inferior maxilla 1 0 0

Total . . . . . 6 0 0

The combined list is as follows

Single Major Amputations	No of operations	Deaths	Mortality percentages
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Amputations of arm	62	1	1.61
Amputations of elbow-joint	3	0	0
Amputations of forearm	56	0	0
Amputations at shoulder-joint	36	2	5.55
Amputations of foot, Chopart's	15	0	0
Amputations of foot, Hay's	21	0	0

Single Major Amputations	No of operations	Deaths	Mortality percentages
Amputation of foot, Lisfranc	1	0	0
Amputations of foot, Pirogoff's	3	0	0
Amputations of foot, Syme's	20	0	0
Amputations of foot, Mickulicz	2	0	0
Amputations of leg, lower third	105	1	0.95
Amputations of leg, middle third	58	0	0
Amputations of leg, upper third	29	1	3.45
Amputations of thigh, lower third	103	8	7.76
Amputations of thigh, middle third	44	7	15.91
Amputations of thigh, upper third	15	3	20.00
Amputations at knee-joint	33	1	3.03
Amputations at hip-joint	10	4	40.00
Total	616	28	4.54

This gives for study 616 single major amputations, 71 double amputations, 20 mixed operations, that is to say, a major amputation and at the same time another major operation done, but not an amputation

In these mixed cases sometimes the secondary major operation was of greater magnitude and more exhausting than the amputation itself. There were 16 triple and 1 quadruple amputations

About fifty of these amputations were done for pathologic conditions, 674 done for crushing injuries received on railroads, mines and factories

Many of the cases were not received at the hospital until several hours after the injury and had to endure the exhaustion of long journeys as well as the shock of the injury and loss of blood. This fact should be borne in mind in noting the mortality rate

This paper is intended to be a study based on the experience of a single clinic. All deductions, analyses and conclusions should be understood as representing the convictions of the chief of the clinic. They may be tinctured by personal predilections and may be erroneous. The statistics have been carefully compiled, however, and they as well as the recommendations are honest.

*Conditions which Require the Amputation of an Extrem-*

ity — Pathologic conditions will not be considered at all, only conditions resulting from violence will be considered

Evulsion of a limb, of course, admits of no question

Annular crushes (that is to say, when all the tissues of a limb have been crushed through the whole of a limited transverse section of the limb), require amputation

When the soft tissues under the skin as well as the bone have been comminuted by a squeeze or pressure of a car wheel or heavy machinery, even though the skin may not be badly lacerated, an amputation will be required

If the bone or bones of a limb be comminuted beyond a distance of 6 cm and the soft tissues immediately about the bone be badly lacerated, one should amputate

Extensive longitudinal and oblique lacerations admit of conservative treatment as a rule, while circular ones are apt to require amputation

Circular lacerations involving the chief blood-vessels and nerves as well as the muscles require amputations

In estimating the condition of an injury the extensive muscular lacerations should receive less consideration than great injury to an extensive area of skin

Compound fractures which sever a large nerve trunk do not require primary amputation, conservatism should always be tried The nerve may be sutured and spliced if necessary

Compound fractures with injury to one system of blood vessels when there are two, do not require primary amputations When both systems of blood vessels are torn, amputation as a rule is necessary Anastomoses of blood vessels at the site of a badly mangled limb, may, as a rule, not successfully be done

When fractures are comminuted as well as compound, injuries to the soft tissues are much more extensive Areas of thromboses will be much greater and conservatism be less successful

In any given case while it is probable that conservative attempts may save a limb but leave it in a useless condition, or in a doubtful state, it would be best to amputate if the

amputation would assure a useful stump, unless the injury be high up in the thigh where the mortality rate of amputation is high.

The individual and his trade or employment should always be taken into consideration in determining whether the probabilities should weight for or against an amputation.

Doubtful conservative attempts in cases of very seriously crushed limbs have a larger percentage of mortality than amputations have. This fact should also be taken into consideration.

In all cases of doubt, having carefully considered the foregoing facts, one should always delay the amputation. *Conservation is always the proper policy when there is a good chance for its success.*

The first sign of gas bacillus or streptococcal infection in these very doubtful delayed cases should determine an amputation immediately, and the open treatment of the stump afterward.

*The Time for Amputation*—Sometimes it is very difficult to determine whether in a given case an immediate amputation after an injury should be done or not. There can be no doubt, in the writer's opinion, that the proper time for an amputation is as soon after the injury as the patient can safely be prepared for the operation, if his condition will permit it. Having, therefore, determined an amputation must be done, the surgeon should carefully examine the general condition of the patient.

A good blood pressure apparatus is an exceedingly useful instrument in making these determinations. Exhaustion from the severity of the injury (Crile's "noci associations" from nerve irritation), exhaustion from psychic shock (this is only temporary), exhaustion from loss of blood, exhaustion from the effects of a long journey to the hospital or to the surgeon, all contra-indicate immediate operations. The degree of exhaustion will be indicated by the blood pressure. In no case operate when the blood pressure is very low.

Psychic shock, by judicious handling of the patient and

the free use of morphine, may soon be relieved and no delay may be necessary. The "noci associations" serve to produce low blood pressure for a longer time. This condition requires relief of nerve irritation by "blocking the nerves," with cocaine, or novocaine, then active heart stimulants. Short delays only are necessary in these cases.

Acute anaemia is the most serious condition of all. This condition requires refilling of the blood tracts as soon as possible. Intravenous infusion of saline solution, hypodermoclysis, proctoclysis, when practicable direct transfusion of blood, besides heart and nerve stimulants should be employed as indicated, and when practicable in the individual cases. Operation must be delayed for many hours as a rule.

The surgeon must thoroughly asepticize the injured member and absolutely control hemorrhage in these cases. He may then wait as long as forty-eight hours if necessary before operating.

As stated before, the first indication of gas bacillus or streptococcal infection makes immediate operation imperative.

In all cases of delayed amputation it is absolutely necessary to control all hemorrhage. It is best to do this when it is fully decided that an amputation should be done, by elastic constriction. When it is practicable the constrictor should be placed over the crushed tissues. When this cannot be done, place the constrictor immediately above the crush and prevent it from slipping by thrusting long sterile pins through the extremity just below the constricting bandage.

A Martin's rubber bandage applied from the fingers or toes upward and *over the crushed tissues to the margin of uninjured tissues* is best in case the limb has not been severed. This makes a safe and less painful constriction.

*It is very important never to remove the elastic constrictor applied to control primary hemorrhage until the limb has been amputated.* Thus the imprisoned micro-organisms which will inevitably develop in the injured area will not be set free in the circulation even for an instant. Besides it saves much

time, as no attempt will be made to clean and disinfect what usually is a hopelessly soiled and infected area

*Points of Selections for Amputations* —As it was said before, this paper is intended to give the experience of one clinic and the lessons taught by this experience. The writer will not go into any argument with authorities either lay (that is the manufacturers of prosthetic apparatus), or professional

The rule should be to amputate as low down as possible in the upper extremity. An inch of length means a great deal in the usefulness of a stump of the forearm or arm. Even if irregular flaps, and in some cases doubtful flaps must be made to gain length in the stump, it is well to save all one can, and if the skin sloughs repair the loss by grafts later on.

Amputations of the lower extremity require a little discrimination in regard to this rule.

For the foot the writer believes the rule should hold, that is to say, leave as much as practicable. In the case of amputations anywhere in the foot, it is important to secure ample and good flaps. Fibrous tissue and contracted flaps with thin covering for the ends of the bones almost always produce painful and comparatively useless stumps of feet.

The clinic at St Luke's Hospital uses mediotarsal amputations (Hay's and modifications of Hay's method) whenever practicable. Chopart's amputation has also given very useful and most satisfactory stumps. It is necessary to have good flaps and flaps which may be brought together without tension, and the anterior tendons should always be cut long enough to form a part of the anterior flaps and be secured by the sutures so they cannot retract. In this way the dreaded equinus produced by the unbalanced contraction of the soleus and gastrocnemius muscles through the tendo achillis may be avoided, and a perfectly movable, well balanced stump be obtained.

Pirogoff's amputation is very rarely used, as osteoplastic attempts are very doubtful expedients in crushed extremities.

Syme's is another amputation which has proven very useful and satisfactory.

Amputations of the leg whenever possible should be done through the lower third, they may be done as high as the junction with the middle and upper third, but very rarely if ever should they be done through the upper third. Upper third of the leg amputations give a mortality greater than at the knee-joint, and the resulting stumps are rarely satisfactory or useful.

Amputations at the knee-joints make very useful stumps. As a rule, the articulating surface should be sawed off so that the intercondylar groove shall be obliterated.

Amputations through the lower third of the thigh give very satisfactory stumps, the mortality is low and usually they heal rapidly. Above the lower third of the thigh the mortality rate increases rapidly. Upper third of the thigh gives very doubtfully useful stumps and the mortality is very high, though one would prefer to amputate there than go to the hip-joint.

*Technic and Methods Used in Amputations* — The introduction of iodine as a rapid and efficient sterilizing agent for the skin has been a boon to the surgeon who has to deal frequently with large injuries. Since Grossich proved its value, the technic of preparation for operations and dressing of injured members has undergone a marked simplification in the clinic.

The patient is anaesthetized. Ether is almost always used by the drop method.

The elastic tourniquet is placed over the crushed tissues and carried just beyond the margin of the wound and fastened firmly in place by sterile muslin bandages, or by clamps, or by pins thrust through the tissues below it, and it is not removed until after the ablation of the part. No attempt is made to wash the end of an evulsed limb or the depth of a soiled wound when an amputation is to be done. The end of the limb or the crushed tissues and tourniquet are covered by sterile cloths which are firmly fixed in place, then the skin above the tourniquet is scrubbed with spirits of turpentine, and while the turpentine is still on it is shaved, again scrubbed with turpentine spirits, then scrubbed with alcohol, and thoroughly

dried, then it is painted for a considerable distance over its whole surface with full strength of officinal tincture of iodine. This is allowed to dry, another sterile cloth is placed over the cloths which encompass the wound, and fastened in place. The limb is then elevated vertically, when possible, and another tourniquet adjusted at a point of selection above the region selected for the amputation.

The surgeon and his assistants thoroughly scrub their hands and forearms with soft green soap and running water, using a stiff brush, and disinfect with a 1:1000 bichloride of mercury solution and dry them on sterile towels. An amputation gown which covers the whole person including the forearms is put on, a respirator is adjusted over the mouth, a cap is placed over the hair, dry sterile rubber gloves are drawn on and upward over the lower part of the sleeve of the operation gown. Thus prepared, the amputation is done as rapidly as practicable.

*As to Flaps*—There is no set rule in regard to them except that they must be wide and long enough fully to cover the stump without tension. It is preferred so to shape the skin flaps that drainage is facilitated by the lines of incision. As much muscle as practicable is included in the stump.

The flaps are formed from without inward and the skin is cut long enough comfortably to enclose the muscles without tension and so shaped that they may easily be adjusted, usually a periosteal cuff is raised and used to cover over the end of the sawed off bone. Osteoplastic operations are very rarely attempted, as it is very doubtful in the severe crushes how far up the injury has extended. Also the osteoplastic operations require more time. The saving of time is usually a very important matter. Besides, the result as regards usefulness of the stumps has been so uniformly good without them that the clinic never adopted osteoplasty in amputations. For the same reasons the cineplastic amputation methods are not used. In pathologic conditions, and in well-to-do patients cineplastic methods may be employed and prove useful.

Nevertheless the profession owes Ceci gratitude for developing the feasibility and usefulness of the cineplastic method

Bunge's aperiosteal method also has not been employed

It seems to the writer that osteoplastic and cineplastic methods of amputation offer many advantages in cases where amputations may be done deliberately and when the conditions calling for amputation are not those usually found in extensive comminutions and recent evulsions

Thrombosis extends always a little distance from the edge of the injury. One never knows in any given case just how far the vessels are thrombosed. These plastic operations would require higher divisions of the bone and soft tissues in order to be quite sure of going through an area clear of thrombi. Besides they require more time to perform, and, as stated before in severe traumatic cases, rapidity of operating is very much to be desired.

Crile's suggestion to avoid "noct associations" by blocking the nerves with local injections of cocaine or novocaine is most valuable. In amputations this may be done rapidly and efficiently by the injection of the principal nerve trunks as soon as they are reached in the dissection before they are divided. This nerve blocking maintains the blood pressure and thus prevents the extension of shock to a fatal issue. It will be shown later on that the large majority of deaths after amputations for injuries occur within forty-eight hours after the operation from asthenia, due to severe forms of shock. All measures which will prevent or lessen shock should therefore duly be considered and be employed when necessary.

Hemorrhage must be most carefully controlled during the operation, and oozing prevented after the operation by ligating or twisting every bleeding point. The matter of oozing (so called) after amputation is not sufficiently considered by surgeons. Undoubtedly elastic constriction long continued, by paralyzing the local vasomotor control, contributes very considerably to this oozing after amputations. In very large limbs or in regions where the dissection must involve a large area, as in upper thigh and hip-joint amputations it is a ques-

tion whether constrictions ought not to be avoided, and, what the writer has called "the gradual dissection method" be employed. That is to say, the same method one uses in dissecting away a breast and axillary glands for carcinoma, or removing any large tumor from the trunk. This method requires more time, but with the blocking method of Crile it may safely be employed. The freedom from oozing afterward more than counterbalances the extra time required. For shoulder-joint amputations and hip-joint amputations the writer recommends this method. It is well to remember that the first incisions should be so placed that the principal vessels can be reached and be ligated at the very beginning of the operation. The subsequent steps would consist in gradually extending the incisions and ligating or catching with hemostats every vessel as it is reached.

Of the ten hip-joint amputations done by the writer all but three were done after this method.

*Results as Regards Usefulness of the Stump*—Of the 724 amputations of all kinds we have records of 18 re-amputations, 1 for conical stump of the upper arm in a young boy, 12 for conical or ulcerated stumps of the legs, and 5 for conical or painful stumps of the thigh. These cases emphasize an important point in regard to amputations near the upper epiphyses in young people. The growth of the shaft of the bones downward in children will nearly always produce a conical stump in a few years, especially in amputations in the upper parts of the arm and thigh. Parents should be warned of this fact. On account of the increased danger of death, however, the knowledge that re-amputation will probably be necessary should not induce the surgeon to make the primary amputation higher up. It is much better to amputate as low down as possible, thus gaining the benefit of the low mortality of the low regions and re-amputate when necessary later on. Conical stumps produced by natural growth of the bones are rarely painful unless irritated by the false limb or some other prosthetic apparatus.

Barring these 18 cases all the patients who survived the

amputations apparently had useful and healthy stumps. There is no note of any case of mediotarsal amputation requiring a second amputation.

*Mortality after Amputations*—It must be borne in mind that the statistics given in this paper are really those of amputations for severe injuries. Only 50 cases are credited to pathologic conditions out of 616 single major amputations. Except from hip-joint amputations there is practically no mortality after amputations done for diseased extremities.

Eight (8) cases only are noted as having died of sepsis or of exhaustion later than forty-eight hours after the operation. In other words, practically all deaths after amputations occur within forty-eight hours after the operation. This fact brings home to the surgeon the immense importance of doing everything possible to conserve the strength and resistance of the patient. By far the most important factor in determining the death of a patient when the surgeon is a good aseptician is *acute anaemia*. The writer has discussed this point frequently and has mentioned it very emphatically in the early part of the paper under the head "When to Amputate". It is not necessary to go into the matter further than to say that all the accumulated experience of thirty years' work in very active traumatic surgery goes to confirm the conviction that the saving of blood is the most important feature in traumatic work and that no major amputation ought to be attempted when a good instrument shows a very low blood pressure. Operations in these conditions should be delayed until by the various modern methods the vascular tension shall have been measurably restored.

Examination of the tables shows that single amputations of the upper extremity except at the shoulder-joint may be done practically without any death. Until the upper third of the leg is reached amputation of the lower extremity below the knee has a negligible mortality rate.

Knee-joint amputations give a very low mortality rate. Above the knee-joint the mortality rate rapidly increases. Middle third of the thigh amputations show a mortality twice

that of the lower third, and the upper third amputations are 40 per cent. more fatal than those of the middle third

Amputations of the hip-joint for crushes of the lower extremity must of necessity be exceedingly dangerous operations. The writer has done seven hip-joint amputations for injuries, two patients died, a mortality rate of 28.57 per cent.

Up to a short time ago the clinic had seven hip-joint amputations with but one death, then came three desperate cases of injury, and two of these died. The record stands at present 10 cases and three deaths, 40 per cent mortality. This is a very high mortality rate, entirely too high, but it must be remembered that individuals who have such extensive crushes of their lower limbs that a hip-joint amputation is necessary, do not escape other serious injuries. In nearly every case there have been other regions of the body injured more or less severely.

Again, the writer must emphasize the point that of the deaths after single major amputations all but six died within forty-eight hours after the operation and they died from asthenia, chiefly from acute anaemia, which was brought about by hemorrhage before they reached the hospital. Later experience has taught us to defer amputation until the blood pressure has been restored to some extent. The statistics show that by this plan the previous mortality rate has been reduced materially.

Also, the post-operative oozing must sedulously be prevented. Too long continued and too tight elastic constriction provokes oozing by paralyzing the vasomotor constrictors. Always there is more oozing after the use of tight constrictors. Amputations at the hip-joint may be done almost bloodlessly by first ligating the femoral vessels at Poupart's ligament, then by careful dissection and the employment of a large number of hemostats control every vessel as it is reached, the extremity may be removed, and if all vessels be ligated or twisted scarcely any subsequent oozing will occur. We have found this a most efficient method.

Major amputations were at all ages from 10 years to 80

years of age, inclusive, at the clinic. The statistics show the deaths have all occurred, with one exception, in individuals between 15 and 45 years of age. One old man past 70 died. Age seems to affect the mortality very little.

What does markedly affect the mortality is the size of the extremity at the point of amputation. This applies to individuals of lean or plethoric condition. Other things being equal, the man with the small wizened extremity stands a much better chance of rapid recovery after amputations than the one with very large and fat extremities.

This fact accounts chiefly for the large increase in the mortality rate of amputations above the lower third of the thigh. Naturally in a large extremity the dissection is extensive, the wound is large, more blood will be lost and there is greater danger of sepsis.

The multiple injuries and mixed operations especially tax the discrimination of the surgeon both as regards measures for sustaining the strength of the patient and the kind and extent of the operations to be performed. The rules laid down in the foregoing pages apply to these cases, however, equally with the single major amputation cases.

The writer has come to the conclusion that it is not so much the loss of the solid tissues of the extremities but the tremendous "nocti associations," and loss of blood which makes double and triple amputations so much more fatal than single ones.

The list of double amputations is large enough to enable one to draw useful conclusions but the triple and quadruple operations are too few to furnish more than suggestions.

At the clinic at St. Luke's Hospital the multiple operations are done synchronously. That is to say, the chief operator and the chief assistant operate at the same time on different extremities, each with a proper corps of assistants. This arrangement permits more rapid work and a shorter period of anesthesia. Very great care is taken in hemostasis and the preservation of all the blood possible. Also saline infusions are used during and after the operation profusely. Morphia

and cocaine, the one for general effect, the other locally, certainly have most efficient effects in these cases Asepsis must most sedulously be carried out.

#### CONCLUSIONS.

A comparative study of the earlier and later lists of amputations shows that the clinic continues to regard the formerly adopted sites of preference the most desirable ones The mediotarsal amputations have increased in number and have gained in favor against Syme's or the lower third of the leg amputations Every increment of an extremity possible to save, without serious danger to the flaps and long disability of the patient, should be retained The exception to this is the upper third of the leg It is better to amputate at the knee-joint than at this region.

As regards the kind of flaps for the forearm, anteroposterior flaps with the posterior one-quarter longer are preferred All amputations of the arm, including those at the elbow, may be done by a circular or modified circular method The adjustment of the flaps may usually be in an anteroposterior direction The retraction of the anterior part of the flap at the elbow will convert a circular into an oval shaped flap, the posterior segment will be much longer This will bring the line of union some distance above the end of the bone

At the shoulder-joint, also, anteroposterior flaps are preferred The anterior flap includes the greater part of the deltoid muscle and is longer than the posterior one The incision in the internal aspect of the extremity should be so placed as to give easy access to the axillary vessels, which should be grasped and controlled as soon as practicable

Mediotarsal and tarsal amputations are preferred whenever practicable when amputation of the foot is required It is especially necessary to obtain good, adequate flaps and cut the anterior tendons long enough to be secured by sutures to the posterior flap when forming the stump

Low down in the leg anteroposterior flaps are preferred

but not the Teale method or any extraordinarily long anterior flap method. In other parts of the leg lateral flaps seem best.

At the knee-joint a long anterior and short posterior flap method is preferred. The patella may be removed or not, according to the conditions of the case.

Lower third of the thigh to the hip-joint anteroposterior flaps with the anterior one longer are usually employed.

We always shape the flaps from without inward, never by transfixion.

The average length of time in the hospital for amputation cases continues to be about 22 days.

The mortality rate for single major amputations has slightly been decreased, viz., from 4.76 per cent to 4.36 per cent. The mortality rate of double mixed amputations has been reduced from 23.68 per cent to 11.11 per cent. The combined mortality of the two series is 4.56 per cent for the single amputations. This is a very low mortality rate for the class of injuries which required these amputations.

The important factors in lowering the mortality of amputations for injuries are:

- 1 Saving of blood
- 2 Careful asepsis or antisepsis
- 3 Discriminating when to operate

The first two will no doubt appeal to every surgeon.

The last one may be resolved practically into the determination of the blood pressure. Operate as soon as the blood pressure will permit. A systolic pressure below 80 should contra-indicate amputation.

## SNAPPING HIP (HANCHE A RESSORT; SCHNELLENDE HUFT)

BY JOHN FAIRBAIRN BINNIE, M D,  
OF KANSAS CITY, MO

Surgeon to the General Hospital, Kansas City

J L K, male, twenty-four years, admitted to General Hospital, Nov 19, 1912. Four years ago his right hip was caught between two railroad cars, causing an anteroposterior crushing. Was treated in another hospital, where he lay in bed 5 months, no splints were used. The hip was useless for almost a year. After recovery he was capable of doing light work.

He now has two complaints (1) A marked rubbing pain at the crest of right ilium when he carries a heavy weight. This has no relation to the occurrence of his second complaint (2) When he jumps or carries a heavy weight there is an audible and palpable snapping at the right hip, which he attributes to the head of the femur becoming dislocated and which he can produce voluntarily.

*Examination*—When the patient leans slightly to the right side the tip of the eleventh rib touches the iliac crest, causing a painful rubbing on motion. There is now tenderness at this point.

This position of bending toward the right is often assumed in an endeavor to prevent snapping of the hip with its disagreeable sensation and feeling of weakness.

When sustaining most of his weight on the right foot, knee extended, if the patient leans toward his left, a thick band of tissue can be felt passing from the lower and anterior part of the trochanter major upward and backward toward the iliac crest. On extending the hip this band slides off the trochanter backward. If now he twists himself so that the right iliac bone moves forward the thickened band slips forward on the trochanter with a sharp "snap," which is palpable, audible at several feet and the jerking movement of the band is quite visible.

If the band is held backward with the fingers no "snap" occurs.

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\* Read before the American Surgical Association, May 6, 1913

cers The motions of the pelvis, which have been described, are equivalent to marked adduction and rotation outward of the thigh In the recumbent position the phenomenon could not be produced. X-ray examination was negative

*Diagnosis*—"Snapping hip"

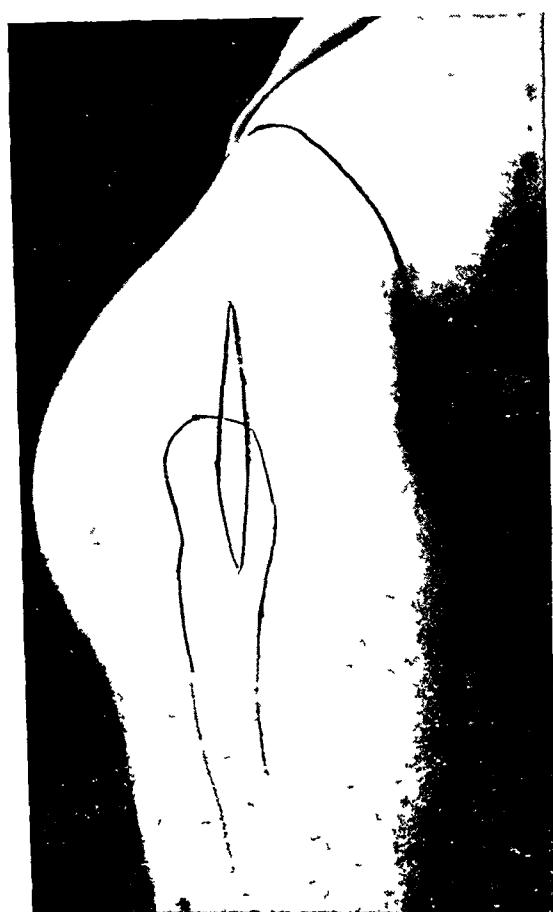
Nov. 20, 1912 Ether anaesthesia Longitudinal incision over great trochanter Corresponding incision through the *fascia lata* There was a sausage shaped thickening of the fascia posterior to the wound and to the great trochanter (the fascio-gluteal tract of Heully)

A flap of the periosteum was raised by longitudinal incision from the femur at the lower part of the trochanter major and the posterior lip of the incised fascia lata was sutured to this and to the *vasius externus* muscle near its origin The anterior lip of fascia was sutured to the posterior in such a manner as to slightly overlap the original line of suture The skin wound was closed and the limb fixed in splints

The patient was seen a month after operation when he was able to work There was no recurrence of the snapping To the patient the right leg now feels longer than the left, this, of course, being due to his ability to straighten the pelvis The pain and rubbing at the crest of the pelvis has disappeared, because the patient no longer bends over to the right, bringing his eleventh rib into contact with the iliac crest as he formerly did

CASE II—F. D., twenty-three Male April 20, 1913 Strongly-built man About seven or eight years ago patient saw another boy creating interest by apparently voluntarily dislocating his hip and reducing it again with a delectable snap He admired the accomplishment so much that he successfully imitated it There is no disability except that the snap is apt to occur involuntarily when he lifts heavy weights The phenomenon can be produced on both sides The following is the sequence of events Bears weight on foot, adducts thigh (or flexes pelvis to opposite side), slightly flexes knee and then a band moves from behind forward over the trochanter with a sudden jerk By reversing the motions at the hip the band jumps back again to its retro-trochanteric position The snap both when the band moves forward and backward is visible, palpable and slightly audible The band is *not* the iliotibial band, but is evidently the anterior margin of the gluteus maxi-

FIG I



Showing relation of snapping band to great trochanter



mus, it follows an oblique line from about an inch anterior to the posterior superior iliac spine downward and forward to the outer surface of the femur five inches below the tip of the great trochanter. This is the location of the band just as it is ready to make its forward snap. The band is about the thickness of a forefinger (Fig. 1).

Thomson and Miles in their small but very satisfactory *Manual of Surgery* (Ed 1912) write of snapping hip that "it is now believed to be due to the tensor fasciae femoris slipping backwards and forwards over the trochanter."

Perrin in 1859 presented to the Societe de Chirurgie a case which he considered to be one of "voluntary dislocation of the hip." In the discussion which followed it was clearly shown that no dislocation of the bone was present, but that the symptoms were due to action of a muscle or band of fascia gliding and jumping over the great trochanter.

Schoemaker (*Zeitsch für Orthop Chir*, 1901, viii, 444) in a paper entitled "Hysterische Huft-haltung" wrote, "there is no subluxation of the hip, the snapping which is produced by slight movements of the hip ought to be attributed to the tense fascia lata passing over the trochanter."

Bayer (*Archiv für klin Chir*, lxxxii, 266) was the first to operate successfully for snapping hip. In his case he made the diagnosis of subgluteal bursitis (hygroma), but on operation found lax connective tissue and no bursa between the tendon of the gluteus maximus and the trochanter. He attributed the symptoms to laxity of the tendon and obtained a cure by an operation similar to that which I have described.

Frequently "snapping hip" follows or is the result of trauma, but Staffel reports that he had been telling a colleague about a case of voluntary dislocation of the peroneal tendons (common amongst spirit rappers) when the colleague replied, "That is nothing at all, I can snap with my hip," and proceeded to show that when he extended his hip a tendinous band of fascia sprang backward over the trochanter with palpable, audible, visible snap.

STAFFEL quotes Zur Verth as follows In my youth I had often to stand for a long time, and to pass the time was accustomed to produce, as I then thought, a dislocation first of one hip and then of the other Under certain conditions the imaginary dislocation occurred easily and without pain, but with an audible and palpable snap, and snapped back again as easily and painlessly No ill results followed this practice When I became a medical student and learned more about dislocations I changed my diagnosis from luxation to subluxation until forced by the publication of recent researches to discard that idea also, and to accept the explanation that the phenomenon was due to the gliding of a band over the trochanter major

These two cases are apparently not of traumatic origin, and certainly there was no disability resulting In both, the phenomenon was evidently due to the passing of a band over the trochanter or the band being fixed, to the passing of the trochanter under it

FERRATON (*Rcv d'Orthopedie*, 1905, p 45) quoted by Heully and others, operated on a recruit under local anaesthesia An oblique incision was made upward and backward from the posterior border of the trochanter major in the direction of the fibres and parallel to the anterior border of the gluteus maximus The anterior fibres of the muscle were penetrated Exposure of the trochanter showed no lesion The subgluteal bursa was normal Voluntary flexion of the thigh provoked a "snap" and at that moment the great trochanter was seen to pass under the muscular mass composed of the anterior fibres of the gluteus maximus If the muscular mass was hooked up with the finger no snapping could be produced

VOELCKER (*Bethage z klin Chir*, lxxii, 619) reported a case of bilateral snapping hip

Right side When patient lay on his left side he could produce the snap on the right Local anaesthesia

Longitudinal incision behind the trochanter Division of the fascia behind the palpable, thickened and visibly retracted iliotibial band, exposure of the subjacent fibres of the gluteus maximus which were divided in the line of the incision Snapping was possible after division of the fascia but not after division of the muscle A mucous bursa, 6 cm in diameter, was seen lying on the trochanter and excised

Left side Division of fascia as on opposite side The gluteus maximus was united to the iliotibial band by a strong tendon which received fibres from the gluteus in a penniform manner As soon as this tendon was divided snapping became impossible

*No suture of fascia to trochanter No recurrence*

HEULLY reports a case from the service of Prof Gross A solidly

built man fell on his right hip—kept on at work but with pain and limping. From time to time there was an abnormal bruit in hip. Six months later he had stooped to pick up a weight when he was straightening himself with the weight, he felt a sharp pain in the hip and was unable to stand up at once. When he did get up he noticed a marked crackling in the hip. Subsequently when he carried weights he had to bear his weight on the left limb.

Examination when the patient was standing showed a muscular prominence apparently due to the tensor fascia lata and accentuated by a depression over the surface of the trochanter major which made the right iliac region appear prominent. The posterior border of the prominence was 6 cm behind the anterior superior spine.

The same muscular prominence was seen on the left side and played no rôle in the production of the symptoms.

On active flexion of the hip to a right angle the following phenomena occurred:

- 1 Under the skin covering the lower part of the trochanteric depression there appeared an elliptical prominence about 1 cm wide and 3 cm long. It appeared when the flexion reached 15°.
- 2 When the flexion reached about 45° this prominence suddenly glided forward.
- 3 At the same instant there was a single dry bruit, like an articular crackle or crepitation.

Palpation of the mobile prominence showed it to be a firm, flattened mass continuous with a band which went obliquely upward toward the iliac crest. The firm mass was 6 cm below the iliac crest. When the thigh was flexed and rotated inward the band became vertical. The phenomenon only occurred on flexion of the thigh on the pelvis or *vice versa*—it never appeared on rotation or inclination of the pelvis. It was easy to determine the exact position of the mass which caused the snap. The upper border was easily found and was 12 cm from the anterior superior spine. The subtrochanteric crest was as easily made out, between these was the outer surface of the trochanter. On flexion an elongated mass showed upon the upper part of the thigh on a vertical line passing along the posterior border of the great trochanter. The inferior extremity of this mass was 6 cm below the tip of the trochanter, the superior extremity reached nearly to the subtrochanteric crest. When flexion attained 45° it suddenly glided forward 3 cm, producing a noise perceptible at a distance. When flexion attained 90° the band prolonging the mobile mass upward was vertical, at 45° it was slightly oblique downward, backward and inward.

Operation showed that the upper part of the femoral insertion of the gluteus maximus tendon was separated for about 1 cm and formed a prominence, about a finger breadth wide, on the deep surface of the muscle. This was the mobile mass which caused the snapping. The band passing upward toward the iliac crest consisted of the anterior border of the muscle, the fascio-gluteal tract. By passive motion it was possible to reproduce the snapping and to ascertain its true cause, viz., undue mobility of the tendon of the gluteus maximus. Suture of the posterior edge of the wound in the aponeurosis—*i.e.*, the portion of the

fascia united to the muscle, to the periosteum of the trochanter and to the vastus externus led to cure

NELATON, imagining that the trouble was due to an atypical subluxation, decided to suppress internal rotation so as to prevent the great trochanter from moving too far from the ischium. He dissected a flap as large as the index finger and 25 cm long from the upper part of the semitendinosus. The pedicle of the flap remained attached to the ischium. He bored a hole through the great trochanter and pulled the free end of the flap through the hole from the digital fossa outward and sutured it to the periosteum on the outer surface of the bone. The flap was long enough to permit of flexion of the hip but prevented rotation inward. Result good.

Out of 41 cases of snapping hip collected from various sources 16 appeared due to trauma, 1 to fatigue and 10 were either congenital or the result of practice. In the rest of the cases the origin was doubtful, some of the patients being military recruits unimbued with professional enthusiasm, others, workmen seeking to take advantage of state insurance and some in which no history was available.

In 17 cases there was a varying degree of disability, in 12 there was no disability, in the rest there was doubt as to disability or no history.

*Causes of Snapping Hip*—The following are some of the conditions blamed for the occurrence of snapping hip:

1. Inflamed serous bursæ. It may be remarked that bursitis has been diagnosed before operation, but that during operation no such condition has been found.

2. Malformation of the joint—e.g., enlargement of the articular cavity, increased length of the neck of the femur, increased prominence of the trochanter major.

3. Repeated, involuntary tic like muscular contractions.

4. Simple voluntary contraction.

5. Muscular relaxation. Kusnetzoff and Pupovac think voluntary contraction alone is incapable of producing the snap. True, it is produced during voluntary contraction, but this only puts the real cause in evidence. To Kusnetzoff the real cause is a relaxation of the gluteus maximus due to hemorrhage while Pupovac says, "I admit that the normal fixation of the iliotibial tract is destroyed by a partial tear of the mus-

cular fibres behind the great trochanter." Bayer thinks trauma causes laxity of the gluteus tendon and this permits the fibres of insertion to glide over the trochanter during active and strong rotation while the gluteus is contracted

Zur Verth believes that a contracted gluteus maximus prevents "hanche a ressort," but that if paralysis weakens the muscle, if a tear separates its transverse fibres from the iliotibial band, if it is elongated by cicatricial tissue, then a sufficient amount of hip flexion determines the snap when the iliotibial band is tense. The necessary tension is obtained by lowering the opposite side of the pelvis (*i.e.*, adduction of the thigh). He writes, "Snapping hip is caused by a trauma acting on the iliotibial band (cristo-femoral tract) or the gluteus maximus and diminishing its contractile power." He also thinks that any one who can voluntarily relax the gluteus maximus is a potential hip snapper.

#### 6 Foreign bodies in or about the gluteal bursa have been considered causes

7 Heully in a very elaborate article and from experiments on the cadaver came to the conclusion that in traumatic cases the trouble was due to rupture of the upper part of the femoral insertion of the gluteus maximus, the divided tendon remaining as a sort of knob on the under surface of the muscle which still acted of course by means of its aponeurotic insertion. The knob of tendon sliding or bumping back and forth over the trochanter major, according to Heully, occasions the audible, visible and palpable snap.

Heully's explanation does not account for the numerous congenital or non-traumatic forms of the trouble. The writer has twice performed Heully's experiment on the cadaver, but found it impossible to produce any approach to a snap with the knob-like stump of the gluteus tendon, and found that the finger placed between it and the bone while the limb was abducted, was not even pinched to any marked degree when the limb was then adducted, flexed and rotated. If, however, the finger was placed between the lower part of the trochanter and the anterior edge of the gluteus maximus

it was painfully pinched. This seemed more marked after than before the tendon was divided.

Heully noted the same pinching under the anterior edge of the gluteus maximus (fascio-gluteal tract) but does not consider this the cause of the snapping. The iliotibial band has often been described as the band which passes over the trochanter with a snap but it is situated rather too far forward to be really culpable.

The fact that any operation which fixes the anterior margin of the gluteus maximus to the trochanter and to the vastus externus is successful in preventing snapping seems to show that the structure is the culprit. This notion is strengthened by Ferraton's observation that when he hooked up the fascio-gluteal tract with his finger, snapping became impossible. Voelker's division of the upper fibres of the muscle gave a good result, probably because he obtained such a great lengthening of the tract that no tension on it was possible. Possibly rupture or division of the femoral insertion may permit a retraction upward and backward of some of the muscle fibres, enough to cause a sausage shaped swelling of the muscle about its anterior margin and so increase the possibility of the peculiar jumping of this tissue over the trochanter when the proper movements are made.

## FIVE CASES OF SUTURE OF THE HEART.\*

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THE heart, so far as we are aware, has been sutured 11 times by Philadelphia surgeons, once by Harte, once by Mitchell, once by Bradbury, once by Billings, twice by Gibbon, and five times by ourselves Six of the patients recovered Harte, Mitchell, and Gibbon have already reported their cases, Bradbury and Billings intend to publish theirs shortly, and the details of our cases will be found below

CASE I—T E, aged twenty years, colored, cook, was admitted to the Jefferson Hospital, February 29, 1904. He had been stabbed in the chest with a long, rusty penknife. The stab caused severe pain, but neither felled him to the ground nor caused him to feel faint. He walked without assistance to the hospital, a distance of one and a half squares, then began to feel weak, and was found crawling up the steps leading to the entrance of the hospital. After being disrobed a small wound was found just above the third rib, about one inch to the left of the left margin of the sternum. The wound was surrounded by an emphysematous swelling, and bled continuously, the stream of blood being accelerated by each expiration. The temperature was 97 degrees, and the pulse 80, empty and markedly irregular in volume and rhythm. He lay on the right side, breathing 40 times per minute in a short, jerky manner. At times he would complain of a little pain and severe dyspnoea. He was sweating and very pale, and had vomited once. There was neither cough nor blood spitting. The entire left chest was tympanitic on percussion. On auscultation the heart beats could be heard indistinctly, there was no bruit or splashing sound. Under ether anaesthesia operation was begun about 45 minutes after the infliction of the injury. Time of operation about 45 minutes. Amount of ether four ounces. An incision was carried along

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\* Read before the American Surgical Association, May 7, 1913

the second rib for four inches to the sternum, then down the left margin of the sternum to the fourth rib, and outward along the fourth rib for four inches.

The musculocutaneous flap was dissected back, and the opening in the chest found between the third and fourth ribs. The exposure was then made more complete by continuing the sternal incision downward for two inches, and the triangular flap thus formed retracted. The third and fourth ribs were severed and forcibly turned toward the right, fracturing the costal cartilages near the sternum. The knife had passed through the anterior edge of the left lung, the lung had collapsed into the vertebral gutter, and the pleural cavity contained a large quantity of clotted and fluid blood. The opening in the pericardium was easily found by the spurting of blood with each pulsation of the heart, it measured about three-eighths of an inch. The pericardial wound was enlarged in the axis of the heart, and a penetrating wound of the anterior wall of the left ventricle found. This wound was parallel to the axis of the heart, nearer the auricle than the apex, and measured about three-quarters of an inch (larger than either the skin, intercostal, or pericardial wound). Bleeding from this wound was free and continuous, whether more marked during diastole we are unable to state, as the heart was now beating very rapidly and resembled a quivering mass of muscle. The wound was closed with a continuous silk suture (six stitches), the sutures being inserted and tied without reference to diastole for the reason already stated. During the suturing the descending branch of the left coronary artery was punctured near its origin with the needle, causing a profuse hemorrhage, which was controlled by an additional suture. The pericardial and pleural cavities were cleared of blood, and the pleural cavity was irrigated with salt solution. The pericardial wound was sutured with a continuous silk suture, a small opening being left at the lower end for the passage of a gauze drain. No attempt was made to suture the lung, as it was not bleeding. A gauze drain was placed also in the pleural cavity, gaining exit at the lower part of the primary incision. The costal cartilages were sutured with catgut, the skin with silkworm gut. During the operation twenty-four ounces of salt solution containing adrenalin were injected into the circulation, and strychnine and

atrophine were administered subcutaneously At the end of the operation the temperature was 100 4 degrees, the pulse 150, the respirations 32

The following day the temperature was 103 4 degrees, the pulse 130, the respirations 56 The patient was delirious and coughed frequently The fever, the rapid pulse, and the rapid respirations continued for 2 weeks The cough gradually grew better after the second week, there was never any expectoration During the first few days there was a copious discharge of blood-stained fluid from the wound On the fifth day the left chest was dull on percussion, and rough breathing with crepitant rales could be heard over the lower part posteriorly Examination of the blood at this time showed erythrocytes, 3,630,000, leukocytes 38,800, hemoglobin, 58 per cent The chest was explored with an aspirating needle, with a negative result On the sixth day pus appeared in the wound Some of the cutaneous sutures were removed on this day and the rest on the eleventh day On the thirty-fifth day the patient was allowed out of bed On the fifty-sixth day he was discharged to return to the outpatient department for dressing, a small sinus leading down to the point where the ribs were severed still persisting, this sinus closed a few days later The pulse varied between 80 and 90 Adventitious sounds were never heard over the heart The left chest expanded very little on inspiration, and slightly roughened breathing, but no rales, could still be heard

The facts just narrated were reported to the College of Physicians of Philadelphia, May 4, 1904 (*Am Jour Med Sci*, Sept., 1904), *i.e.*, a little over two months after the operation The subsequent history of the case is now published for the first time Some weeks after leaving the hospital the sinus reopened and finally discharged a long silk thread, probably the one that had been put in the pericardium The patient worked as a janitor and subsequently as a delivery man for a grocer, an occupation necessitating the handling of heavy baskets and boxes His health remained good up until the summer of 1908, when he was readmitted to the Jefferson Hospital for tuberculous inguinal adenitis At this time ether was administered and the caseous glands removed There were no symptoms referable to the heart or the lungs Shortly after this operation, however, signs of

pulmonary tuberculosis developed, from which disease he died, Feb 14, 1909, 5 years after the injury to the heart. The notes of autopsy, which were kindly made by Dr Krumbhaar, follow:

*Anatomical Diagnosis*—Pulmonary tuberculosis (extensive, bilateral, with cavities and small areas of gelatinous pneumonia) Chronic adhesive pericarditis (following stab wound) Localized chronic interstitial myocarditis and antemortem thrombus (left ventricle) Chronic adhesive pleurisy (bilateral) Operative scar on left chest Anæmic infarct of spleen Slight red atrophy of liver Chronic interstitial orchitis

*Heart*—After considerable dissection the heart is separated from the parietal pericardium. It is free only for a small area about the apex. Over most of its surface are somewhat cobwebby, fibrous adhesions, that are broken up without much difficulty. In one spot, however, over the anterior surface of the ventricular septum, the size of a silver dollar, the adhesion is very dense, so that it has to be cut with scissors. The heart is but slightly enlarged, weighs 370 grams. It is fairly firm, the color being obscured by the thickened pericardium. On opening, the musculature of the right ventricle is found to measure 47 mm and to be a normal reddish-brown, except under the area of the dense adhesions, where it is much more yellow, though firm. On dissecting away the fibrous tissue over this, it is very hard to tell where the musculature begins. The cavity of the left ventricle is large, the muscle 12-14 mm thick and of normal color, except under the above mentioned area, where it is much yellower. Toward the apex in the region of the septum it is much thinned and distinct grey lines can be seen running through it. Greyish-red spots, which on dissection show distinct lines of Zahn, are firmly adherent to the septal region. The mitral valves show occasional yellowish dots, the aortic valves are normal. There are occasional slight thickenings of the intima of the aorta. The coronary arteries are free from sclerosis. On dissecting out the branch to the ventricular septum, it is suddenly lost at a point 3 cm below the auriculoventricular septum and has evidently been obliterated.

*Lungs*—Both lungs are enlarged and riddled with tuberculosis. On removing the right lung, which is rather extensively adherent to the parietal pleura, a quantity of purulent fluid escapes. This is found to come from a large cavity occupying practically all of the upper lobe, which is ruptured on removal. The lung is everywhere filled with small and conglomerate caseous tubercles and occasional small cavities are found. The process seems less advanced and more acute in the inferior lobe, where the tissue has a gelatinous, homogenous appearance. The left lung presents a similar appearance to the right except that the cavities are fewer and smaller and no gelatinous areas are found.

*Microscopic examination of the heart*—Sections show epicardial fat to be in most places replaced by a fairly dense fibrous tissue, in which small vessels are numerous. The tissue stops raggedly and no epicardium is visible. Throughout all sections there is a marked increase of inter-

stitial tissue, in some areas about blood vessels, in others rather diffuse, while in some, large spaces are found with practically no muscle fibres in them. These contain numerous small vessels. The muscle fibres are in good condition, except those on the edge of or in the isolated fibrous areas. Section through the wall and thrombus shows the same condition of the heart wall, with thrombus closely applied to the endocardium. In no case, however, is the endocardium broken or missing, and no organization of the clot is found. The clot consists of a fibrinous network enclosing many or few leukocytes, alternating with areas in which the red blood cells predominate. Section through the septum immediately inferior to the supposed site of the wound shows the interstitial fibrosis to be even more marked. The muscle fibres in less involved areas are thin and often wavy with loss of cross striae. The epicardial area shows numerous vessels, including one large one, that are normal, and several nerves cut in cross section. About these and in their capsules are fairly numerous connective tissue cells. No thrombosed vessels are found.

CASE II.—A J., aged thirty-six years, colored, laborer, was admitted to the Pennsylvania Hospital Feb 15, 1909. He had been stabbed with a long knife and had started at once for the hospital. After walking about 2 squares he fainted, and was carried into the hospital pulseless and unconscious. He soon revived, however, and when we saw him the pulse was 100, but very weak, the mucous membranes pale, the temperature 97.4° F., the respirations 26. He was conscious and did not complain of pain. The whole left chest, including the cardiac area, was tympanitic, and emphysematous crackling could be felt beneath the skin of the left breast. The heart sounds were weak, but there were no murmurs. Under ether the operation was begun one hour after the injury and lasted 15 minutes. The knife had entered the skin at the middle of the left anterior axillary fold, split the pectoral muscles, and penetrated the second intercostal space midway between the primary wound and the sternum. An incision was made along the second rib from the sternum to the level of the wound in the intercostal space, then downward to the fourth interspace, and inwards to the sternum. The third and fourth ribs were severed at the level of the longitudinal incision, and the flap thus formed turned back over the sternum by fracturing the costal cartilages. The internal mammary artery was not seen. The lung was collapsed and apparently not wounded. The left pleural sac contained a large quantity of blood. An opening large enough to admit the finger was found in the upper anterior part of the pericardium. This was en-

larged in the axis of the heart and a wound about  $\frac{1}{2}$  inch long found in the left ventricle near the auriculoventricular juncture and near the interventricular septum, the wound running parallel with the septum. It bled continuously, but the bleeding was more marked during the cardiac diastole. The wound in the heart was approximated with rat-toothed forceps and so held while a continuous silk suture (4 insertions) was inserted. The pericardial sac was not distended but contained considerable fluid blood and a long red rope-like clot. After removing this blood the pericardium was sutured with catgut. The pleural cavity was drained by means of a rubber tube inserted through an incision in the seventh interspace in the posterior axillary line. The severed costal cartilages, the interchondral spaces and the pectoral muscles were sutured with catgut, the skin with silkworm gut. A gauze drain was inserted in the stab wound as far as the chest wall. No stimulants were given before the operation; during the operation strychnine gr  $\frac{1}{30}$  was injected subcutaneously. At the completion of the operation the pulse was 100, the respirations 36, the temperature 97 degrees.

The following day the temperature was 102.6 degrees, the pulse 120, the respirations 60. The temperature remained between 101 degrees and 103 degrees for 10 days, then slowly fell until it reached normal on the 26th day, the pulse and respirations behaved in a similar manner. On the third day the gauze wick was removed from the stab wound and the rubber tube from the pleural cavity, both having ceased to drain. The skin sutures were removed on the eighth day, and several ounces of pus evacuated from beneath the upper and outer angle of the flap. There was no pus in the original stab wound or in the pleural wound, both were closed. All wounds were healed on the 25th day. On the 30th day the patient was permitted to sit up and a day or two later to walk. The temperature having been normal for 16 days, suddenly on the 42nd day ascended to 101 degrees. Examination of the chest by Dr Newlin revealed a precordial area of dulness, extending from the right edge of the sternum to one cm beyond the nipple line and from the clavicle down to the stomach. The apex of the heart could be felt in the fifth interspace, midclavicular line. The heart sounds were feeble and rather distant. At the aortic cartilage the second sound was split. Below the left clavicle and in the left axilla the breath

sounds were feeble, distant, and tubular. The lower chest posteriorly was tympanitic, no fluid could be obtained by aspiration. Several days later a skiagram was made, and showed a dense area corresponding to that which had been outlined by percussion. The temperature continued above normal until the 52nd day, when after several unsuccessful attempts to obtain fluid by aspiration the fourth rib between the axillary lines was resected and about one pint of thin yellow pus evacuated from the pleural cavity. Two weeks later (65 days after the original operation) the patient left the hospital with a discharging sinus. At the present time (May, 1913), he is languishing in the penitentiary for burglary. The heart is acting normally and there are no murmurs.

CASE III.—E. M., aged twenty-six years, colored, was admitted to the Pennsylvania Hospital June 17, 1910. He had been stabbed with a pair of scissors. There was a transverse wound in the skin one and a half inches long, in the third intercostal space close to the sternum. The temperature was 95 degrees, pulse 130 and irregular, the respirations 30. The mucous membranes were pale, the patient conscious, and the veins of the face, neck, and arms distended. There was some emphysema below the wound in the skin. The heart sounds could be heard faintly but no murmurs were detected, cardiac dulness extended from the right margin of the sternum to the nipple line. Auscultation and percussion over the rest of the chest were negative, there was no pneumothorax. Before we reached the hospital the resident physician attempted to infuse salt solution into a vein of the arm, but the intravenous pressure was so great that the solution would not run into the vein. Operation was begun two hours after the injury and lasted 35 minutes. On introducing a finger into the external wound it passed downwards and entered the thorax in the fourth interspace close to the sternum. A straight incision was made from the inner angle of the original wound downwards along the margin of the sternum to the fifth costal cartilage. The fourth costal cartilage was then severed at its sternal end and with the underlying triangularis sterni turned outward without injuring the pleura. It was now found that the wound in the pericardium was up beneath the sternum on a level with the third costal cartilage, which therefore was turned outward like the fourth costal cartilage. Subsequently, in order to

obtain more room the fifth costal cartilage was treated in a similar manner, the incision along the margin of the sternum being continued downward to the sixth rib. Thus there was a triangular chondrocutaneous flap containing the fourth and fifth cartilages. The third cartilage was detached from the skin but hinged to the chest by muscular tissue. The pleura, with the lung, was separated bluntly from the pericardium and retracted outward. The pleura was not injured either before or during the operation. The pericardium was tensely distended, liver-colored, and not pulsating. There was no bleeding from the pericardial wound until it was enlarged, when a large amount of fluid and clotted blood escaped, and the pulse immediately fell to 80 and became regular. The cardiac wound was transverse, one-quarter inch long, and in the right auricle. The bleeding from the heart was continuous, the stream spurting about two feet. A finger was placed over the wound and two catgut sutures (No 3) inserted. Four additional sutures of fine catgut were needed to control the bleeding from the suture holes. The pericardial sac was irrigated with salt solution, the pericardium and the costal cartilages were sutured with catgut, and the skin wound was closed with silkworm gut sutures. Drainage was omitted. At the end of the operation the temperature was 95°, the pulse 116, and the respirations 30.

The following day the temperature was 101 degrees, the pulse 120, the respirations 40. The fever persisted for about one week, when the superficial stitches were removed and a few drams of pus evacuated. The wound healed subsequently without extension of the infection. On the second day the systolic blood pressure was 115, the diastolic 85, hemoglobin 78 per cent, R. B. C. 3,335,000, leukocytes 15,500, polynuclears 82 per cent, lymphocytes 10 per cent, mononuclears 25 per cent, transitional 2 per cent, undetermined 35 per cent. The patient had a slight cough for about two weeks, but no abnormal physical signs could be detected in the chest. On one occasion the sputum was faintly blood tinged, no tubercle bacilli were found. The patient was kept in bed two weeks and had completely recovered by the end of the third week. He remained in the hospital, however, for two months, performing the services of an orderly. He was last seen in the spring of 1912 (two years after operation) at which

time he was in perfect health, no adventitious sounds could be heard over the heart.

CASE IV—J. S., aged twenty-three years, colored, laborer, was admitted to the Pennsylvania Hospital July, 1910. He had been stabbed in the chest with a knife during a brawl and was found by the police "lying in a pool of blood." He was unconscious when he reached the hospital, but partly revived before the time of operation. The temperature was 96, the pulse 90 and very weak, the respirations 28. There were drops of sweat on the face, which was very pale. In the fifth interspace directly under the nipple was an almost horizontal wound, one inch long, which entered the thoracic cavity, oozed blood continuously, and was surrounded by an emphysematous swelling. The left chest was tympanitic. The heart sounds were faint but distinct and there were no murmurs. The operation was begun one and a half hours after the injury and lasted 40 minutes. An incision was carried from the inner end of the stab wound inward to the sternum, then upward along the left margin of the sternum to the third intercostal space. The fourth and fifth costal cartilages were severed near the sternum, and the flap turned outward by fracturing the cartilages at the axillary extremities. The left lung was collapsed and the pleural cavity contained a large quantity of blood. The pericardial wound, which was oozing blood, was enlarged, and a transverse wound, about one inch long, found in the left ventricle near the apex. Blood was spurting from this wound, which was temporarily closed with the finger while a continuous catgut suture (seven insertions) was applied. It was necessary also to tie a large branch of the coronary artery which ran to the wound. At this time it was noticed that the cardiac muscle around the wound, over an area of about one inch in diameter, appeared to be abraded. A large amount of clotted blood was removed from behind the heart, the pericardium and the costal cartilages sutured with catgut, the skin with silkworm gut. A rubber tube was inserted into the pleural cavity through a short incision in the seventh interspace, post axillary line. During the operation one pint of salt solution was given intravenously. At the end of the operation the temperature was 94.6, the pulse 100 and very weak, the respirations 30.

The next day the temperature was 103, the pulse 140, the

respirations 60, the icterus 4 Gm. the hemoglobin 7.7 per cent, the red cells 2,500,000. The pulse and the respirations remained rapid and the patient died 41 hours after operation. The autopsy notes follow.

*Anatomical Diagnosis*—Infected wound of left ventricle. Acute fibrino-purulent pericarditis. Acute myocarditis. Acute vegetative endocarditis of mitral and aortic valves. Acute fibrino-purulent pleuritis (left side).

The left lung is collapsed and consolidated, the left pleural cavity filled with yellowish fluid, and masses of fibrin resembling custard. This fluid had not drained through the tube because of adhesions which had formed between the lung and the chest wall in front of time. The pericardium is filled with the same sort of material as the pleural cavity.

*Heart*—The heart measures 14 x 9 x 4.5 cm and weighs 480 grams. On the anterior surface of the left ventricle, beginning about one cm above the apex and extending upward toward the base just to the left of the septum, is an area, measuring 3 x 1.5 cm, which is slightly depressed below the surrounding muscle and is of a light greenish-grey color. The main descending branch of the left coronary artery runs just to the right of this area. A large branch of this artery, which is given off about 3 cm above and admits a probe of about 2 mm diameter, runs to the border of this area and is lost in the greyish, soft tissue. In the middle of the above mentioned grey, depressed area is a wound measuring 3 cm in length closed by a continuous catgut suture. Sagittal section of the wound shows it to extend into the muscle obliquely, slightly bearing toward the septum. It is about 12 mm in depth. It does not seem to extend into the left ventricle, there being a ridge of tissue about 2 mm thick intervening between the bottom of the wound and the endocardium. On the endocardial surface immediately beneath the wound there is a small amount of smooth, elastic, soft, chicken fat clot which is easily pulled away, leaving an apparently smooth endocardium. Section of the heart muscle about the wound shows an area on each side of the wound which is soft and greyish and rather sharply demarcated from the surrounding heart muscle. At the extreme tip of the left ventricle is a yellowish-brown streak in the heart muscle fading gradually into the normal muscle. The muscle at some distance from the wound is uniform, brown, and seems normal. The right auricle, tricuspid valve, right ventricle, and pulmonary auricle appear normal. Along the line of closure of the auricular surface of both flaps of the mitral valve is a line of small vegetations. A slight amount of red elastic fibrin is adherent to these vegetations. They are of about pin-head size and in places conglomerate. Similar acute vegetations are present along the ventricular surface of the leaflets of the aortic valve. The aortic vegetations are similar to those on the mitral valve but not so extensive. The arch of the aorta above the valves is smooth and patchless.

*Microscopical examination of Heart*—A series of sagittal sections

was made through the region of the wound in the left ventricle All sections are similar They show a heavy fibrinous exudate on the pericardial surface mixed with clumps of cocci A large coronary artery in the section is occluded by a thrombus The adventitia is necrotic and pink-staining, and in it are seen deep blue-staining masses of bacteria On each side of the wound there is a wide band of hyalin, necrotic muscle fibres showing here and there a glial mass of bacteria Beyond this there is a zone of intense leukocytic infiltration with some fibrin and hemorrhages There are bacterial emboli in some of the vessels Beyond this still are seen fairly normal muscle fibres The deepest portion of the wound is glued together by a thrombus about 15 mm thick, composed of hyalin, fibrin, leukocytes, and red blood cells, *i.e.*, the wound penetrated into the ventricle A few of the muscle fibres on each side of this are necrotic and there is some infiltration of leukocytes between them

CASE V—G E, aged twenty-one years, colored, laborer, was admitted to the Pennsylvania Hospital Jan 1, 1911 The police had found him lying in an alley and thought he was dead His temperature could not be ascertained, as it was below 94, the lowest mark on the thermometer, this low temperature was due in part to the state of the weather, which was very cold The patient was unconscious, pale, pulseless, and breathing six times to the minute The left chest was tympanitic anteriorly, dull posteriorly, the heart sounds could not be heard He was revived somewhat with stimulants, so that at the time of operation the pulse was 108, but scarcely palpable, and the respirations 52 He was still unconscious, but it was necessary to give a little ether because of his tossing about The stab wound in the skin was in the second left interspace about one inch from the sternum, the wound in the intercostal muscles in the third interspace, the wound in the pericardium beneath the third costal cartilage, and the wound in the heart beneath the second costal cartilage An incision was made from the original wound to the sternum, then downward to the fourth interspace and outward, the third and fourth costal cartilages were severed near the sternum and the flap turned outward The left lung was collapsed and the pleural cavity contained a large quantity of blood The anterior edge of the lung had been perforated but was not bleeding At one point it was bound to the pericardium by a band as thick as a finger The pericardial wound was enlarged and a wound found in the right ventricle, this was closed and the heart steadied with rat-toothed forceps while a continuous catgut suture (3 inser-

tions) was applied. A large amount of clot was removed from behind the heart, the pericardium and the costal cartilages sutured with catgut, the skin with silkworm gut. Just after the heart had been sutured the patient stopped breathing and the pulse fell to 52. Artificial respiration for several minutes was followed by spontaneous breathing. During the operation one quart of salt solution was injected intravenously. At the completion of the operation, which lasted about 25 minutes, the pulse was palpable but uncountable, the respirations 60.

The patient died one hour later, the respirations becoming slower and slower, and finally ceasing before the heart stopped beating. At the autopsy the cardiac wound was found to be one-half inch long, it passed into the right ventricle one and one-half inches below the pulmonary valve and just to the right of the interventricular septum, and then through the septum into the left ventricle about 2 inches below the aortic ring. Both ventricles were hypertrophied and the mitral valves were badly diseased.

It is not our intention in this paper to enter exhaustively into the subject of wounds of the heart. When we reported our first case we presented a brief history of the development of cardiorrhaphy and analysed the 60 cases that were on record at that time. Later with Le Conte, we attempted to set down systematically the results of a study of the literature bearing upon the surgery of the pericardium and the heart (*American Practice of Surgery, vol. vii*). Here we shall confine ourselves mainly to the ideas that we have formed, concerning the diagnosis and the treatment of cardiac wounds, as the result of our brief experience.

In all of the cases cited above we were sure, or at least as sure as a surgeon should be, that a wound of the heart existed, but we were equally certain of the same diagnosis in several other cases of wound of the thorax in which exploration revealed no wound in the heart. In each of these instances of mistaken diagnosis the thoracic wall was penetrated over the heart, the patient was profoundly shocked, and there existed a hemopneumothorax. In two of these cases, cases of gunshot wound, the pericardium had been grazed and contused but not penetrated. In another case of gunshot wound the

bullet lodged in the pericardium, which contained a few drams of blood, and the heart was contused. In two cases of stab wound the knife had passed down between the pericardium and the lung. In all of these cases the pericardium was incised in order to permit direct inspection of the heart. In two other cases of stab wound of the precordium in which the general phenomena of shock were so pronounced as to suggest the possibility of injury to the heart it was found that the knife had not entered the thoracic cavity. It will thus be seen that a wound in the precordium, even though penetrating, may not involve the heart. Further, the heart may be reached by a knife or a bullet which has passed through the skin of the axilla, back, or abdomen.

Nor can any conclusion as to the participation of the heart in a wound be drawn from the amount of external bleeding. The only really enormous external hemorrhage that we have seen resulting from a wound of the heart caused death within 45 minutes. The patient had been stabbed near the hospital, and we chanced to be in the Receiving Ward when she was admitted. There was a gash several inches long in the left chest, and through this, the hole in the heart could be seen. We immediately closed this hole with the undisinfected forefinger, but life was extinct before sutures could be inserted. In none of the cases of cardiorrhaphy was the blood, at the time of examination, issuing from the cutaneous wound in more than a trickle. This may be accounted for partly by the valvular nature of the tracts leading from the skin to the heart. It is impossible with a single thrust of a narrow bladed knife to create a channel from the skin to the heart which will remain straight. So soon as the patient lies down the thoracic skin glides upward for one or two inches, and the heart likewise ascends. If the pleural cavity is, at the same time, opened, the heart is displaced farther by the resulting pneumothorax. In all of our cases the wound in the heart was above the wound between the ribs, and in three the cutaneous wound was on a level with the interspace next above the one that had been penetrated, thus making the tract V-shaped. In two of these three cases, in one of which the pleural cavity was not opened,

it was noticed that the wound in the heart was considerably higher than the cutaneous wound, hence we conclude that the heart is likely to ascend to a greater extent than the skin. In addition to the influence of this augmentation of the tract made by the vulnerating instrument in retarding the outward escape of blood, external hemorrhage is apt to be insignificant, or perhaps even absent, because the blood finds one, and usually two, reservoirs, viz., the pericardial and pleural cavities, into which it may flow unhindered. Consequently a bleeding intercostal or internal mammary artery unassociated with a wound of the pericardium or the pleura may give rise to considerable external hemorrhage because, aside from the cellular tissue, there is no place in which the blood can accumulate, and a wound which involves the pericardium or the pleura may exsanguinate the patient without pouring blood through its external orifice. Apart from its effect in determining the amount of blood which appears on the exterior, this gliding of the tissue, resulting from change in posture, may become a matter of serious importance, from a medicolegal standpoint, to one who attempts to estimate the direction of the original wound.

In four of our cases the local signs of hemopneumothorax were in evidence, and in these cases the area of cardiac dulness was replaced by tympany. In one case, in which the pleura was not injured, the area of cardiac dulness was greatly enlarged. In all cases but one (Case V, in which the heart gave no audible evidence of its activity), the heart sounds were faint but distinct, and in none could any adventitious sound referable to the heart be heard. It may be that some of the bizarre bruits described as indicating a wound of the heart are due in reality to the noise occasioned by the passage of air through the wound in the thoracic wall. In Case I the garrulity of the thoracic wound could have been misinterpreted readily, if on auscultation the opening in the thorax had not been temporarily plugged. Subcutaneous emphysema, which was noted in four of our cases, likewise may interfere with satisfactory auscultation.

The general symptoms of shock and acute anaemia were

pronounced in all of our cases. It is worthy of remark, however, that the pulse, although exceedingly weak and in two instances irregular, was 100 or below in three cases, 108 in another, and only 130 in the case with the highest count. In two instances the patient walked for some distance after the accident. Distention of the veins of the face, neck, and arms, indicating pressure on the auricles as the result of hemopericardium, was present in only one of our cases. This sign, combined with an increase in the area of cardiac dulness, is almost, but not quite, distinctive of a wound of the heart, since it may follow also a wound of the pericardium alone or a wound of the great vessels within the pericardium. External evidences of hemopericardium, however, are not often encountered, because in most instances the blood, even though prevented from flowing out through a valvular opening in the thoracic wall as fast as it flows from the heart, finds an unobstructed outlet into the pleural cavity, and, further, the air in the pleural cavity dislocates and extends over the heart, thus replacing the dulness by tympany. If, as in Case III of the present series, the channel left by the traumatizing agent is strongly augulated and the pleura is not injured the conditions are ideal for the development of the typical signs of hemopericardium and cardiac compression. Doubtless the X-ray would demonstrate an augmentation in the shadow cast by the heart, owing to the accumulation of blood about it, in every case, for the pericardium always contains a large quantity of blood, even when this blood is not under sufficient tension to embarrass noticeably the venous flow to the auricles, but to make a roentgenologic examination in such an emergency would very rarely be for the patient's best interests. Aside from the signs of hemopericardium and cardiac compression, which, when following a penetrating injury capable of reaching the mediastinum, always indicate involvement of the pericardium or the heart, there is nothing to render a diagnosis of a wound of these structures certain except direct palpation or inspection.

In our earlier cases we disinfected the skin with soap and water, alcohol, and bichlorid of mercury, which method consumes too much time if done thoroughly and is unreliable if

done hurriedly. Much more rapid and certain is painting the skin with strong tincture of iodin. After disinfecting the skin we have excised the external orifice of the wound, and then determined whether or not it entered the thorax by digital examination. If the finger passed into the thorax we endeavored to feel, as others have done, the opening in the pericardium, without, however, success, except in the case mentioned above in which death occurred before the heart could be sutured. Failing to discover the pericardial opening in this way we have made a chondro-cutaneous flap of sufficient size to uncover, when turned back, a large area of the pericardium, whereupon the opening in this membrane could be seen and felt without difficulty.

The size and shape of this chondroplastic flap we have varied according to the situation of the external wound and the amount of room necessary to expose and suture the wound in the heart. When the lung was collapsed the flap was made rapidly by cutting through all the tissues, including the costal cartilages, with a sharp, heavy-bladed knife, and then fracturing the cartilages corresponding to the base of the flap by reflecting the flap forcibly, to the left in three cases, to the right in one. So long as there is a pneumothorax it probably makes little difference in which of these directions the flap is turned, and one may be guided by the location of the external wound. If the pleura has not been injured, however, it is of the greatest importance to preserve that membrane intact, and this can be done best by turning the flap to the left, as described in Case III, in which a wide exposure was obtained easily and quickly by pushing back the unopened pleura from the pericardium. Resection of the sternum, we believe, will rarely be indicated, if we dare venture an opinion from the comparative facility with which we were able to suture a wound in the right auricle in this case (Case III) after reflecting the costal cartilages alone. If the external wound were to the right of the sternum and the right pleura were opened one would make the flap in the right instead of in the left chest.

After turning back the flap in the thoracic wall we have enlarged the pericardial opening in the axis of the heart, and

explored the heart by palpation. We have never been able to see the wound in the heart, because of the copious hemorrhage, before it was discovered with the finger. Inspection was useless until the bleeding had been controlled temporarily by digital compression and the blood removed by sponging. Although we have always found the wound in the heart quickly, this is not always possible. Some years ago we watched one of Philadelphia's most skilful surgeons hunt for a number of minutes after the heart had been exposed before the wound was located, and there are several cases on record in which the operator searched vainly for a wound which autopsy revealed to exist.

In all of our cases the blood spurted continuously from the heart, and in Case II it was noted that the spurting was accentuated during diastole. In three instances the finger was kept on or in the cardiac wound until a suture could be inserted. This suture was then used as a tractor while the remaining portion of the wound was closed. In Cases II and V the wound was approximated with rat-toothed forceps during the suturing, this greatly facilitated the operation, and there was no tendency to tearing of the muscle as has been observed by other surgeons, but in Case V the pulsations of the heart fell from 108 to 52 and the patient ceased breathing for a short time, possibly as the result of the greater firmness with which the heart was held by the forceps as compared with a suture tractor. In Case II, however, the cardiac pulsations remained unchanged despite the use of forceps. Here we may call attention to the behavior of the pulse during operation in the other cases. In Case I it became very rapid and continued irregular; in Case III, in which the typical symptoms of cardiac compression were in evidence, it fell, as soon as the pericardium was opened, from 130 to 80 and became regular; in Case IV it increased from 90 to 100.

A continuous suture was employed in all cases, because it can be applied more quickly than interrupted sutures, and because it presents fewer knots on the surface of the heart, and less opportunity for leakage between the points of insertion. The needle was passed deeply without reference to systole or

diastole, and in Case III (wound of the right auricle) must have penetrated the endocardium. Silk was used in the first two cases, and in one of these gave rise to a sinus through which the silk was discharged. In the remaining cases catgut was used. The longest wound in the heart was one inch, and to close this a continuous suture of seven insertions was necessary. In three instances additional sutures were needed to control the bleeding, once because of spurting from the needle punctures (Cases III, wound of the right auricle), once (Case IV) to tie a large branch of the coronary which ran into the wound, and once (Case I) to tie the descending branch of the left coronary close to its origin, where it had been accidentally wounded by the needle. This case of ligation of the left descending coronary artery is of considerable importance in view of the statements of some anatomists and physiologists regarding the fatal effect of suspension of its function. So far as we know this artery has been tied four times in the human being during cardiorrhaphy. Vince's patient died on the second day of pneumonia, Cappelen's on the second day of pyopericardium, Pagenstecher's on the fifth day of empyema and pericarditis. Our patient recovered and was apparently not inconvenienced by the obliteration of his coronary artery. At autopsy, however, five years after the accident, it was found that the wall of the left ventricle was the seat of interstitial myocarditis and in one place near the apex greatly thinned. In all of our cases we found a large quantity of clotted blood in the pericardial sac behind the heart. This clot was scooped out with the fingers and any remaining fluid blood removed with sponges.

In the first case we drained the pericardial cavity with gauze, purulent pericarditis followed. In the other four cases the pericardium was closed without drainage, two of the patients recovered without empyema of the pericardium, one died in one hour, and one died in 41 hours, the pericardium containing large masses of thick custard-like fibrin, which could not have been removed by drainage, and a comparatively small amount of pus. Unless forced to change our present

views we shall not, if we have an opportunity to perform another cardiorrhaphy, drain the pericardial sac. Drainage does not prevent infection, indeed a drain favors infection, especially if the heat strikes against the material employed. Some operators, instead of placing a drain in the pericardial sac, have left the lower part of the pericardial wound open, and inserted a drain down to the opening. This may prevent the irritation and the consequent exudation resulting from the friction between the heart and the drain, but will not prevent the passage of air through the hole in the thoracic wall on its way to and from the pleural cavity when there is a pneumothorax, *i.e.*, in 95 per cent of the cases. If the pericardium is closed completely and pus later accumulates in the pericardial sac drainage is of course indicated.

In two of our cases a wound of the lung was seen, but, because of the absence of bleeding, was not sutured. Drainage of the pleural cavity was instituted in the four cases in which there was a pneumothorax. In the three in which the patients survived long enough for suppuration to occur empyema developed. At present we should not drain the pleural cavity. We should employ the Auer-Meltzer insufflation apparatus during the operation, remove all the blood from the pleural cavity, and close the thorax completely, or if the insufflation apparatus was not at hand, close the thorax completely and withdraw the air from the pleural cavity by aspiration. The only discernible objection to this course is the possibility that distention of or suction upon the lung might renew or increase the bleeding from a wound in the lung. The importance of an air free pleural cavity, however, cannot be overestimated. The large volume of air existing between a collapsed lung and the thoracic wall contains a great number of bacteria, and unless this air is removed the bacteria settle on the pleura and give rise to infection. In a recent case of exploratory thoracotomy for a stab wound of the lung, the wound in the lung and in the thoracic wall was closed, and as much air as possible aspirated from the pleural sac, recovery followed without empyema.

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the obliterative kind combined with an Ane ligation, on account of the impossibility of controlling the blood in the sac

CASE I—*Left iliofemoral fusiform aneurism, obliterative method, with ligation of the external iliac artery Recovery Death later* S McC, white male, aged twenty-nine years, nativity, Nebraska, occupation, laborer and soldier, inmate of the Government Hospital for the Insane, had the following history.

He deserted from the army and was arrested and sent to prison, where he developed dementia præcox and was sent to the Government Hospital for the Insane, August 30, 1906

The aneurism was first noticed the following November Previous to its discovery the patient had complained of pain along the inner side of the ankle, the calf of the leg, and over the tumor There was no history of injury, and he denied having had syphilis but confessed to the free use of alcohol and tobacco The patient was a medium small, well built and fairly well nourished white man with brown hair, blue eyes and a dull, somewhat depressed facial expression The apex beat of the heart was displaced slightly to the left of the mammary line There was a marked systolic murmur heard with greatest intensity at the apex, transmitted toward the axilla and also heard at the angle of the scapula There was also an aortic, diastolic murmur of nearly the same degree of intensity Pulse regular, 86 to the minute A swelling 3 inches long and one and a half inches in width, was noticed in the left groin There was an expansile pulsation and distinct bruit Antisyphilitic treatment was tried without benefit, the aneurism was enlarging and it was decided to do Matas' operation on him Under ether anaesthesia, December 19, 1906, the aneurism and artery above and below were exposed by an incision extending along the femoral artery upward across Poupart's ligament, then outward to the outer side of the inguinal canal, cutting through the muscles and stripping up the peritoneum until the external iliac was exposed as high as the bifurcation of the common iliac The aneurism was about two inches long, irregularly fusiform in shape and extended above and below Poupart's ligament The iliofemoral vein was closely adherent to the inner side of the aneurism—too close to dissect free The artery was clamped

above and below by rubber padded forceps. This stopped pulsation but on opening the sac, red blood flowed out, not in jets, but in a free and steady stream Attempts were made to control this flow by pressure beneath, and to the inner and outer sides, thinking it might come from a collateral branch, but without effect So the walls of the sac were sutured together and then turned in by a second row of catgut sutures The external iliac artery was ligated with kangaroo tendon about one and one-half inches above the sac, and the wound was closed No pulsation in the arteries of the foot could be felt at the close of the operation The entire extremity was wrapped in cotton and the foot elevated The leg and foot kept warm but no pulsation could be felt until fifteen days after the operation (January 3) when it was felt in both tibials at the foot The patient made an uneventful recovery from the operation but died about 3 months later (April 9) from disease of the heart Through the courtesy of Dr Wm A White I was able to get a report of the necropsy which is given below It will be noted that another aneurism was discovered, situated on the superior mesenteric artery

*NECROPSY* — “*External Examination* — The body is that of a white man, fairly well nourished The skin is slightly jaundiced There is a punctiform eruption of the face and neck There is a large scar in the left iliac region, the result of an operation

*Internal Examination* — Inspection Skull is broad in front, sutures persistent in frontal region The skull is rather dense and thicker than the average Dura is normal There are pleuritic adhesions on the left side There is an increase of pericardial fluid The abdominal fluid is also much increased and is bile stained

*Dissection* — Thoracic Cavity Lungs are œdematosus and russet color The posterior portion of the right shows some small hemorrhages Right lung weighed 600 grams, left lung 660 grams

Heart Weight, 500 grams Is much dilated The tricuspid opening admits four fingers The pulmonary valves are normal The anterior wall of the right ventricle shows yellow patches, probably indicating some disease of the muscle The aortic valves are almost destroyed by a warty endocarditis Two of the valves are perforated and must have been useless The

mitral opening admits three fingers and shows very little disease

Aorta This vessel is rather small, its walls are thin, there is no arteriosclerosis, the only abnormal appearance seen is a whitish deposit in the intima, probably a fatty infiltration. The lesion is situated in the thoracic and abdominal portions of the vessels. On the superior mesenteric artery at the origin of its principal branches is a small sacculated aneurism about  $1\frac{1}{2}$  inches in general diameter. This aneurism is filled with clots, but the circulation has been kept up by the open lumen of the vessel posteriorly, and all the branches are pervious.

The aneurism which has been the seat of operation was examined and at the site of the operation it was extremely difficult to trace the vessel, so obliterated had it been by inflammatory changes. The vessel from the ligature to the origin of the internal iliac artery was filled by a tough partially adherent clot. The demonstration of the collateral circulation was too difficult, and was not done.

*Abdominal Cavity*—Liver Weight, 2160 grams. This organ is enlarged and shows a marked nutmeg appearance, with an irregular distribution of the blood (Acute stage of passive hyperæmia). The gall-bladder contains about 30 cc of thick darkropy bile.

Kidneys Are œdematosus. The cortex is wide and relatively paler than the pyramids. The capsule adheres slightly leaving a few pits over the surface which are not easily explained. Both are in the same condition. Weight of left kidney 190 grams. Weight of right kidney 170 grams.

Spleen Weight, 410 grams. It is much enlarged. The pulp is soft and full of blood, the result probably of infarctions. The organ is adherent to parts in its vicinity.

*Cranial Cavity*—Brain Weight, 1580 grams. Is rather pale. The arteries are not diseased. The right posterior communicating artery is large. The corresponding posterior cerebral is small. The anterior cerebral of the right side and the anterior cerebral of the left are large. Both efficient anterior cerebral arteries come from the same side and are distributed as usual. On the right side the posterior inferior cerebellar is absent, its place taken by the anterior inferior cerebellar.

*Conclusion*—The absence of any arteriosclerosis and the presence of localized aneurismal dilatations of the aorta lead to

the conclusion that the condition must have been due to syphilis. The liver was not scarred and there were no other signs of syphilis."

CASE II.—*Popliteal aneurism Right side Reconstructive method Recovery February 26, 1910 J. E., male, colored, forty years old, nativity, Virginia, laborer Admitted to Emergency Hospital*

*History*.—Patient has had pain in the right knee for about one year but did not know the cause of the trouble. Examination revealed a swelling about the size of a hen's egg in the popliteal space, a little external to the median line, pulsating strongly—

FIG. 1.



Side view Dotted line indicates suture restoring artery to normal size

the pulsations being arrested by pressure on the femoral artery at the pelvis

Under morph atrop ether anaesthesia, an incision was made over the swelling, exposing the sac and the artery above. At the lower end of the sac a second aneurism was found, about half the size of the first, oblong and separated from it by a constriction (Fig. 1).

During the dissection the pulsation in the large sac suddenly ceased and on opening it, in addition to the old laminated clot which partially filled the sac, another clot of bright red color was found filling the sac and evidently the cause of the arrested pulsation. It ha during process of uncovering the ves-

sels above and below in order that the blood current might be controlled during the operation of suturing the sac. The blood current was controlled by a rubber tube passed around the artery above and clamped with haemostats, the sac was incised, the clots turned out and the cavity wiped clean. The walls were then turned in by continuous sutures of No 1 chromic catgut as shown by the dotted line in Fig 1, thus restoring the original lumen of the vessel.

A second row of sutures was added turning in an additional coat over the first. Blood was allowed to run through by relaxation of the rubber tube and as there was some leaking a third row of sutures was added along both sacs and a fourth row over the larger sac in order to dispose of its coats. Feeble pulsation in the artery below could be felt after the conclusion of the operation. Wound in skin closed with catgut. Patient was put to bed with leg wrapped in cotton and elevated. No pulsation could be felt in the foot.

Next day (27th) feeble pulsation could be felt in the dorsalis pedis artery and the patient was doing well.

February 28 Patient doing well, foot and leg warm but no pulsation could be felt in the foot or leg. No pain, only a slight feeling of numbness in the leg and foot.

March 5 First dressing—primary union. No pulsation in foot, but it is as warm as its fellow and the patient is quite comfortable.

March 13 Permitted to sit up in a chair, condition same.

March 19 Wound healed, condition of circulation same. Discharged, recovered.

When last heard from, about one year later, the patient was apparently well.

# ARTERIOVENOUS ANASTOMOSIS FOR THREATENED GANGRENE OF THE FOOT.\*

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REVERSAL of the circulation has been attempted in but 50 or 60 published cases of incipient or fully developed gangrene of the extremities, and the results apparently have been so conflicting that the value of the operation is still under discussion. The following case is reported with the idea of adding to the clinical evidence from which final conclusions must largely be drawn.

About two years ago a Russian Jew, aged thirty-nine, developed "Raynaud's disease." The left hand was cold, numb, cyanotic and painful, and finally the tips of several fingers became gangrenous. Without treatment the difficulty gradually disappeared, leaving a few smooth, white scars only.

Six months later severe pain was felt in the calf of the right leg, soon shifting to the vicinity of the large toe, and during the next year or so extensive gangrene of the foot slowly appeared, which finally necessitated amputation of the leg below the knee on July 6, 1912.

Recovery was prompt, but in the course of three or four months, to the consternation of the patient, similar trouble began in the left foot. On December 26, 1912, the foot was cold, numb and cyanotic, and no arterial pulsation could be detected. Gangrene, with ulcerations about the nails, was just beginning at the tips of the first and second toes, shading off toward their bases in a slight bluish discoloration, without even a suggestion of a line of demarcation. There was continuous and exhausting pain.

Through the newspapers the patient had heard of reversal of the circulation in cases like his own, and insisted upon having

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\* Read before the American Surgical Association, May 7, 1913

this done before consenting to an amputation. Although faith in the procedure was lacking, it was decided to try it, on the principle that if the chance of success was small the danger of doing harm was equally so.

On December 28, 1912, assisted by Dr O M Shere, a lateral anastomosis was done between the femoral artery and vein, about the middle of the thigh, the vein being exposed peripherally, as far as practicable, and its lateral branches tied. In order to prevent the blood from returning immediately toward the trunk, the vein was proximally ligated, but the artery was not disturbed, thus preserving any remaining circulation which might exist.

For lack of finer material, a number 12 needle with number 16 silk thread were employed. These were soaked in liquid vaseline, which was also smeared liberally over the exposed tissues. After isolating sections of the vessels with rubber-covered clamps and removing the adventitia, oval openings were snipped from their corresponding sides with iridectomy-scissors, the blood washed out with normal salt solution in a medicine-dropper, and the anastomosis completed by a sort of reversed gastro-enterostomy stitch, which turned the edges of the intima outward, leaving a smooth surface internally, one or two extra stitches being required when the clamps were removed. The blood immediately passed in a full stream through the opening, a strong pulsation being seen and felt in both artery and vein as far as they could be followed.

On the next morning, somewhat to our surprise, the skin of the foot, which previously had been cold and cyanotic, was warm and pinkish in color, although the veins of the leg were not distended and no pulsation could be felt anywhere. The pain and numbness had largely disappeared and it was plainly evident that a marked change for the better had occurred. The patient stated that he could feel the warmth and sensation returning a few hours after the operation.

This improvement lasted for several weeks, although it became gradually less manifest as time progressed. A distinct line of demarcation rapidly formed at the base of the large toe and somewhat lower down on the second toe. Altogether it seemed likely that a satisfactory result might be obtained, but to our disappointment the old condition slowly returned, the line of demarcation disappearing and the gangrene progressing on to

the dorsum of the foot, requiring removal of the leg below the knee on February 26, 1913, eight and one-half weeks after the original operation.

Before amputating, an incision was made over the anastomosis in order to observe its condition, it being argued that if blood was still passing into the vein a lower amputation might be done than if the opening was obliterated. On making a slit into the vein blood flowed freely from below, but the anastomosis was evidently closed. A soft dark clot, about the size of a small bean was found adherent to the anastomotic site by its upper extremity. An examination of this, made by Dr. Phillip Hillkowitz, revealed "an inner core consisting of red cells and leucocytes" surrounded by "a broad zone of young fibroblasts imbedded in a structureless stroma," showing that "the clot had been formed several weeks before removal." The character of this thrombus hence pointed to a comparatively recent origin, and indicated that the circulation through the anastomosis perhaps had been efficient for a time at least.

A careful dissection of the amputated leg, made by Dr. Shere, showed marked sclerosis of the arteries and obliteration of their lumina.

The further progress of the case was uneventful.

Between 50 and 60 arteriovenous anastomoses for established or threatened gangrene have been reported, the former operations merely being done in the questionable expectation of saving more of the limb than ordinarily would be possible. The great majority of these cases have terminated unfavorably, in that the circulation of the affected part underwent no immediate improvement, or the improvement was but temporary.

This lack of success has been attributed to a variety of causes—to an improper selection of cases, to defective technic, to immediate or secondary thrombosis, to lack of post-operative care, etc.,—but most surgeons prefer to believe that it is due to inherent deficiencies in the operation itself. Among the apparently successful cases, a number, when considered from an unbiased standpoint, are open to serious question, some being unconvincing and others having

been reported too soon to be of value Bernheim (ANN. SURG., Feb., 1912) places the apparent successes at 30 per cent, but in the estimation of many others this is much too high, and the real successes, if any, are probably far below this.

It has been demonstrated with reasonable certainty that a limited quantity of arterial blood may penetrate to the terminal ramifications of the femoral vein after its junction with the artery (2 to 4 per cent according to Rothmann). It hardly seems justifiable, however, to assume that it will continue to do so, at least in adequate amount, after the numerous lateral anastomotic veins have had time to become dilated, thus carrying the blood back toward the trunk by a much easier and shorter route. Nevertheless, it might be imagined that in certain individuals these veins are unusually few in number or small in calibre, and that under such conditions a reversal of the circulation would be satisfactory in its ultimate as well as in its immediate effects. In order to reduce the number of these lateral veins, it has been suggested that as many as possible be tied at the time of the operation, as was done in the case just reported. This is of course proper enough as far as it goes, but one cannot tie them all, and it is questionable if the obliteration of a few is of sufficient importance to justify the extra time and manipulation required.

It is doubtful if the successful cases reported in connection with the upper extremities (Bernheim, J. A. M. A., Feb., 1913, p. 360, Wieting, *Zent f Chir.*, No. 12, 1913, p. 450) are of much value, because spontaneous recovery from beginning gangrene of the fingers is not of uncommon occurrence. In fact, in the case just described, it will be recalled that without treatment of any sort the disappearance of a marked lesion of this kind was so complete that only a few smooth, white scars remained. Similar recoveries have also been seen by the writer and by many others in connection with beginning gangrene of the toes, especially under the favorable influence of rest, posture, improved nutrition, and

stimulation of the circulation, which, it should be remembered, are likewise taken advantage of following arterio-venous anastomosis

In estimating the worth of the operation it should also be borne in mind that some of the apparently beneficial effects may be due merely to obstruction of the venous circulation. For instance, von Oppel tied the popliteal vein in a case of threatened gangrene of the foot, the procedure being shortly followed by a return of warmth, color and sensation to the affected part, together with the disappearance of the pain which had previously existed—phenomena which, according to Davier, most certainly indicate the success of an arterio-venous anastomosis! In this connection Moskowicz says (*Zent f Chir*, No 14, 1913, p 507), "It is more probable that Wieting's anastomosis between the femoral artery and vein owes its effectiveness more to the passive hyperæmia from ligation of the vein than to an actual reversal of the circulation"

From theoretical considerations and from the results so far obtained in arteriovenous anastomosis for threatened gangrene of the extremities, the following conclusions may, perhaps, fairly be drawn

1 Although the procedure is justifiable in a few well-selected cases, it seldom has been followed by success, and even then its real value may be questioned, owing to the fact that spontaneous recoveries occasionally occur—with as much frequency, possibly, as do operative successes

2 Owing to the uncertainty of the value of the operation, one should at least endeavor to do as little harm as possible. Hence, from this point of view, it is better to do a side-to-side anastomosis, or to implant the distal end of the vein into the side of the artery, rather than to unite the two vessels end-to-end, thus preserving to the limb its remaining arterial circulation, however little that may be

3 According to our present knowledge, operations upon the upper extremities should be considered with reservation, owing to the comparative frequency of spontaneous recoveries

# CONTRIBUTION TO THE STUDY OF SARCOMA OF THE FEMUR.

PERIOSTEAL ROUND-CELLED SARCOMA OF THE FEMUR, INVOLVING TWO-THIRDS OF THE SHAFT, WITH VERY EXTENSIVE MULTIPLE METASTASES—APPARENT CURE BY THE MIXED TOXINS OF ERYSIPELAS AND BACILLUS PRODIGIOSUS WELL 10½ YEARS, WHEN A MALIGNANT TUMOR (SARCOMA AND EPITHELIOMA) DEVELOPED IN THE THIGH AT THE SITE OF AN OLD X-RAY DERMATITIS \*

BY WILLIAM B. COLEY, M.D.,

OF NEW YORK,

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THE patient who is the subject of this paper was shown before the New York Surgical Society on a number of occasions. A full report of the condition up to May, 1912, will be found in the November, 1912, number of the ANNALS OF SURGERY, p 787. The case, at the time of publication, was, as far as I know, entirely unique, being the only one on record of a periosteal round-celled sarcoma of the femur, with metastases, cured by any method of treatment. Of 68 cases of periosteal sarcoma of the femur collected by Butlin, treated either by amputation at the hip-joint or just below the trochanter, only one was permanently cured (well eight years), and in this case there were no metastases. Since the earlier report of my case developments have occurred which render it of still greater interest.

When the patient came under my care in February, 1902, for sarcoma, periosteal, round-celled, involving two-thirds of the shaft (the diagnosis confirmed by microscopical examination by Dr E K Dunham, Professor of Pathology of the Bellevue University Medical School), the involvement of the femur was so great that I advised immediate hip-joint amputation, which was refused by the patient. X-ray treatment was administered for a prolonged period, during which an extensive metastatic tumor occurred in the left pectoral region. A little later, a tumor the size of a child's head developed in the iliolumbar region, involving the ilium. The tumor of the pectoral region was partially removed and X-ray treatments for a short time after the operation were given. No X-ray was applied to the large iliolumbar tumor.

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\* Read before the American Surgical Association, May 7, 1913

The toxins were given from February 12 to July 25, 1903, in doses ranging from 5 minim to 20 minimis, 86 injections in all being given. The temperature rose to 103.5° F. As stated in the earlier history, the large iliolumbar tumor became almost completely broken down under two months' treatment with the toxins, and drainage was established by an incision made through the upper and posterior part of the ilium, and a large quantity of necrotic tissue evacuated. The patient went on to complete cure and remained well over ten years. Aside from the persistent dermatitis which followed the irritation from the X-ray, in the lower and anterior portion of the thigh, there was also some slight dermatitis in the pectoral region. At the time the patient was shown before the Surgical Society, in April, 1912, a small tumor, the size of an olive, had just developed in the pectoral region at the site of the dermatitis described. This was removed under cocaine the following week and pronounced epithelioma by Dr Jas Ewing, Professor of Pathology of Cornell University Medical School, without any connection whatever with the original sarcoma. The patient remained well during the summer, but in the latter part of October, 1912, when I again saw him, I found a very remarkable change had taken place in the old dermatitis in the lower part of the thigh. There was a very large ulcerating area, fully 10 inches in diameter, which showed unmistakable evidence of malignant degeneration, the discharge having the foul odor characteristic of epithelioma. The ulceration rapidly extended in all directions until it covered an area fully 12 x 12 inches and was constantly increasing in thickness. The general health of the patient also became greatly deteriorated. The appearance of the surface of the tumor was extremely characteristic of the tumors which I have seen originate in old X-ray burns. The disease in this case apparently started in the skin and subsequently involved the deeper layers, instead of beginning in the bone and spreading externally. This fact was distinctly shown by the X-ray photograph. The structure of the tumor proved to be very unusual, and different diagnoses were made by several pathologists, although the tumor was regarded by all as highly malignant. I am fortunate in having been able to obtain the following very clear and full report from Dr W H Welch, professor of pathology of John Hopkins University.

*Examination of Fragments of Tumor for Dr W B Colby (Nov 27, 1912)*—The specimen consists of several small irregular, rather ragged fragments of solid tissue, the largest being about 2 cm long, 1.5 cm broad and 0.6 cm thick. Upon two of the pieces epidermis can be recognized along one margin.

The microscopical sections show a neoplasm composed of cells and stroma, the former predominating. Some of the sections show only the tumor tissue, others present upon the edge of the tumor an ulcerated surface covered with fibrin, leucocytes and red corpuscles, and two sets of section show cutaneous tissue covered by a thick layer of epidermis. In these last sections the subcutaneous tissues are occupied by the tumor, which has evidently invaded the corium from below and in places appears to have reached the epidermal layer.

The tumor is composed mainly of cells with, as a rule, rather scanty fibrous stroma. The cells vary in size and shape but spherical, oval and polyhedral cells of rather larger size with large vesicular nuclei, containing nucleoli, and with abundant cytoplasm, predominate. There are also fusiform cells, often occurring in bundles, cells with irregular nuclei and with two, three or more nuclei are common. In some fields the cells are closely compacted, while in others there is more of delicately fibrillated or even coarsely fibrous connective tissue between the cells. There is no marked tendency to arrangement of the cells in nests or alveoli.

While considerable parts of the tumor show no evidence of degeneration or marked inflammatory infiltration, there are areas which are extensively invaded with polynuclear leucocytes and lymphocytes, and here the nuclei of the tumor cells often stain diffusely or show other evidences of regressive changes. In parts not thus invaded nuclear figures are numerous.

In the sections presenting a covering with skin, the deeper layers, corresponding to the subcutaneous tissue, show a sarcomatous growth of essentially the characters already described, but in most places extensively invaded with leucocytes.

In the dense fibrous tissue of the corium, in which sections of small hair follicles are numerous, there are scattered strands and islands of richly cellular tissue. The typical large tumor cells can occasionally be seen in these cellular foci, but many of the cells are smaller and appear to lie in and around blood and lymph capillaries, the endothelium of which is swollen and proliferating. The majority of cells in these foci appear to be lymphocytes and plasma cells.

The epidermis is moderately infiltrated with wandering leucocytes. There is some thickening and down growth of the interpapillary processes of epithelium, and over an area of about one millimetre in extent in the sections, where the cellular infiltration of the corium is most extensive beneath the epidermis, there is such an irregular and considerable down growth of the epidermal cells as to suggest an epitheliomatous growth.

*Diagnosis*—Large round-celled sarcoma.

There is no objection also to the designation of mixed-celled sarcoma, although the round-celled type predominates. The type is like

that of many periosteal sarcomata, as is indicated by the large cells with irregular and multiple nuclei. The specimen is evidently from metastases invading the skin, if, as I understand from the clinical history, the primary growth was of the periosteum.

While much of the tumor shows the ordinary appearances of sarcoma, it is interesting to note the considerable areas undergoing degeneration and especially the extensive infiltrations with leucocytes.

The interpretation of the lesions of the corium and epidermis over the subcutaneous sarcoma is not so obvious. While occasionally cells resembling the sarcoma cells are seen in the cellular foci of the corium, especially those nearest the subcutaneous growth, many of these foci appear to consist of capillaries with swollen and proliferating endothelium and of accumulations of lymphoid and plasma cells, so that these lesions are probably best interpreted as in the main of a chronic inflammatory character, that is a dermatitis.

The question as to the interpretation of an apparently invasive downward growth of epidermal cells, as described above, can hardly be positively answered. Inasmuch as atypical downward growths of cutaneous epithelium with inflammations and ulcers of the skin are common and sometimes extensive, it is possible that this is the correct interpretation of the lesion in this case. Still I should not be willing positively to exclude the possibility of a true epitheliomatous growth superimposed upon the sarcoma. The main growth, however, is, as described, a round-celled sarcoma of the type most frequently originating in the periosteum or endosteum (peripheral or central sarcoma of bone).

Pathologist, William H Welch

Taken from Dr Welch's letter dated December 23, 1912

"I spoke to Dr Halsted about your specimen. He was extremely interested, and thought that the evidence for efficacy of the treatment by your method was strikingly manifested by the history of the case, and so it seems to me. To have brought about the disappearance of the tumor and to have kept the growth in check for ten years, and then to have the same (presumably) type of growth reappear in the original site and this a markedly malignant type of sarcoma, is a unique chain of events, which is perhaps more convincing than the disappearance of a tumor without a later return. I have not expressed this very clearly I fear, but you will see the point as it impressed Halsted."

(Signed) WILLIAM H WELCH  
(Professor of Pathology at Johns Hopkins University, Baltimore)

I also obtained reports on the tissue removed, from Dr Jas Ewing, professor of pathology, Cornell University Med School, and Dr W C Clark, pathologist at the General Memorial Hospital. Their reports are as follows:

"The tissue in the A G case shows intact epithelial lining, extensive oedema in many pockets. The derma is the seat of productive

new growth of tissue which, in many places, is composed of cellular and mucoid material Many spindle- and star-shaped cells—large or huge hyperchromatic nuclei Such areas grade insensibly into new cellular tissue in which the structure resembles that of large spindle-celled sarcoma. Here the cells are very numerous, large nuclei hyperchromatic, blood-vessels numerous Parts of these areas are traversed by numerous elongated blood sinuses lined by spindle tumor cells, and the whole process suggests great potentialities of independent growth To call it sarcoma, seems to me to dismiss it inadequately, but the clinical course may very well be that of spindle-celled sarcoma

(Signed) J EWING"

Dr William C Clark's report reads as follows

Tumor of skin of leg, December 21, 1912 Patient, A G

Gross examination shows a mass projecting slightly above surrounding skin level This mass is sharply outlined, measures a cm in diameter, it is roughened and much firmer in consistency than the surrounding tissues

On cut section the tumor is found to be sharply outlined, is oval and measures 6 cm in depth

Microscopic examination shows that the tumor is a part of the true skin, that is, the epithelial structures of the true skin become a part of the tumor

The tumor proper consists of large epithelial cells of the squamous variety with relatively large deeply staining nuclei This is especially true of the cells on the deeper part of the tumor

The epithelial cells of the central and superficial parts of the tumor are pale, with pale nuclei At one point in the epithelium there is a small cyst The periphery of the tumor in contact with the deeper tissues is made up of rounded masses, and columns of epithelial cells, but the general outline of the tumor is sharp, clean cut and is not infiltrating the surrounding tissues There is an extensive round-celled infiltration There is no sign of ulceration

*Diagnosis*—Epithelioma of the basal-cell type

I advised amputation of the leg as soon as the diagnosis was made, but failed to get the patient's consent until January 2, 1913 He was anxious to have the toxins tried again, and they were administered regularly from November 18, to December 5, 1912, in doses ranging from 5 minim to 5 minims, 12 injections in all being given, with no apparent effect upon the progress of the disease The surface of the tumor was also treated with large doses of very strong radium ointment, principally in the hope of overcoming the very foul odor from the discharges No effect was noted, however

He also had one injection of colloidal copper. In view of the patient's failing general health and weak condition, all treatment was abandoned.

*Later History*—After the case was reported before the Surgical Society, December 11, 1912, the patient's general condition continually grew worse, and his consent to have the leg sacrificed was finally obtained. On January 2, 1913, I amputated under nitrous oxide gas and oxygen. The entire operation, including the closing of the wound, took 13 minutes. Although the larger nerves were not cocainized, he showed very little shock from the operation, no nausea or vomiting, and made a very good recovery. The limb was taken to the laboratory of Cornell Medical School and Dr Ewing made a further study of the tumor. His second report reads as follows:

Case of G, April 23, 1913. Tumor of femur. Specimen consists of a leg amputated through the upper third of the thigh. The skin is absent over the anterior and lateral surfaces of the region of the knee-joint for a distance of 20 cm, and in its place is a hard nodular growth, pale in color and spotted here and there with ecchymotic areas varying in size from a pin point to 4 and 5 cm in diameter, and small ulcerating areas (5 to 15 cm) containing white cheesy-like material.

On vertical section the tendon and lower portion of the rectus femoris, to within 2 cm of the patella, is replaced by a tumor mass for a distance of 14 cm. This mass appears quite separate from the periosteum of the femur, a layer of fat being interposed. At its widest point it measures 6 cm. Its upper surface is covered with skin and subcutaneous fat, but the remaining portion has broken through the integument and produces an ulcerating area which is seen on the surface of the limb. The surface of this mass is smooth, white and glistening.

At the point of amputation, the diameter of the femur is not increased and the compact bone appears to be normal, the medullary cavity contains a reddish-brown marrow. In the lower third of the bone, it measures about 7 cm in diameter and the medullary cavity has entirely disappeared, the compact bone is atrophied, in places being only a shell. Where the normal marrow cavity ends, there is a small deposit of cancellous bone, just below this, there are two bone cysts, measuring 5 and 15 cm in diameter and lined with a glistening membrane. Extending from the cancellous bone, posterior to the cysts, is a mass of ivory-like compact bone which takes in the entire diameter of the femur just below the cysts. Below this compact bone is a sequestrum, 45 cm in length, the remains of what appears to have been a part of the shaft of the

femur, this lies in cancellous tissue. Just above this condyle in the medullary cavity is a well circumscribed tumor measuring  $5 \times 3$  cm.

The cut surface is white and granular in appearance and cuts with considerable resistance, the edges are well marked and the tumor does not appear to infiltrate the surrounding tissue.

The cancellous tissue in the condyles appears normal. Patella shows osteoporosis. The head of the tibia shows atrophy of compact bone. Medullary cavity is normal, except for an area 5 cm long by 3 cm wide, in which the marrow appears to be denser than the surrounding tissue.

*Microscopical*.—The compact tumor measuring  $5 \times 3$  cm in the marrow cavity of the lower end of the femur, is an adult acanthoma (epithelioma). It is composed of compact masses of stratified squamous epithelium of adult type, with spines and pearls and many large, almost cystic areas of hornified material. The stroma is cellular connective.

The tumor in the rectus femoris is composed of many large and small polygonal and spindle tumor cells, with vesicular hyperchromatic nuclei and prominent nucleoli. These cells invade the muscle tissue in rows, small groups, and diffusely. Muscle cells undergo simple atrophy.

The origin and nature of this tumor, I am unable to determine. It appears to be of rapid growth and of recent date. Its structure would ordinarily be designated as sarcoma. I do not think it arises from the femur, since the underlying periosteum is intact and separated from the tumor by a layer of fat tissue. The sequelæ of the original process in the bone are probably to be found in the cysts, the areas of osteosclerosis, and the large sequestrum mentioned in the gross description. It is difficult to determine whether or not these gross lesions can be interpreted as the result of an arrested sarcoma. It would seem possible that they might result from an old osteomyelitis with formation of sequestrum, osteosclerosis and bone cysts.

The epithelioma in the medullary cavity may be interpreted as a metastasis from a lesion in the skin resulting from the X-ray, but no such tumor was recognized in the ulcerated surface of the amputated specimen. It is very probable that the tumor of the quadriceps was an extension from the peculiar process in the ulcerated superficial tissues and that it resulted from the long use of the X-ray.

One to two weeks after the operation the patient developed metastases in the lung and probably also the peritoneum and died on January 16, 1913.

*Blood Analyses*.—The various blood counts in this case are of interest.

November 6, 1912 W B C 15,000, haemoglobin 70 per cent

December 12, 1912 W B C 20,000, R B C 3,000,000 haemoglobin 60 per cent

December 19 1912 Hæmoglobin 50 per cent

December 28 1912 Hæmoglobin 60 per cent

He also had one injection of colloidal copper. In view of the patient's failing general health and weak condition, all treatment was abandoned.

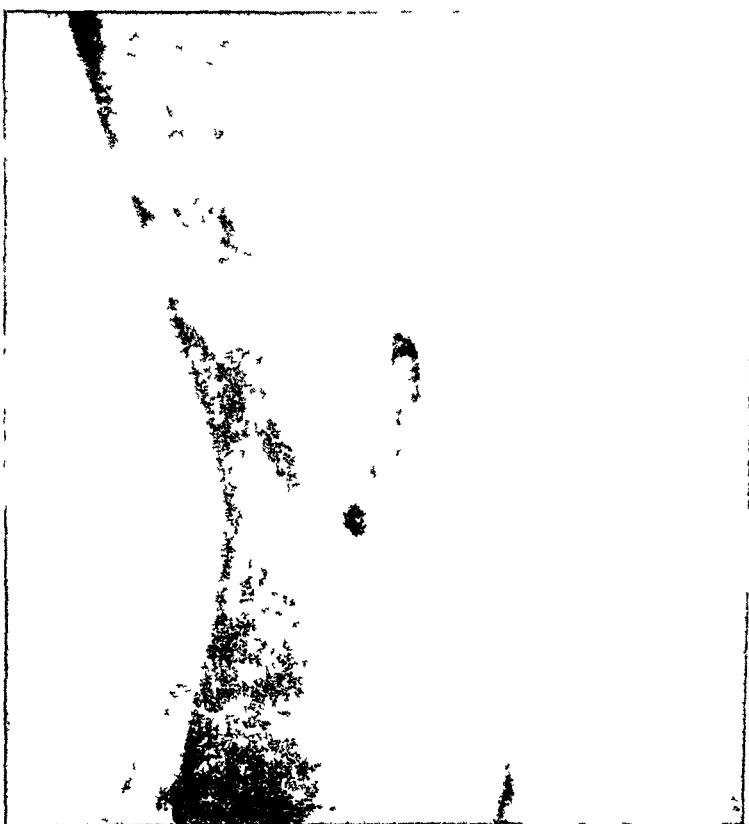
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FIG 1



Sarcoma of left femur before treatment Subperiosteal round-celled Showing exploratory incision made in February 1902 Under X-ray treatment developed extensive metastasis in left pectoral region and right ilolumbar region Apparent cure by mixed toxins of erysipelas and bacillus prodigiosus Patient well ten years later

FIG 2



Sarcoma of femur after six months X-ray treatment\*

FIG. 3



Metastasis in pectoral and lumbar regions. Showing dermatitis in ant and site of epithelioma which developed ten years later

FIG. 4



Appearance September, 1911

FIG 5b



FIG 5a



X-ray taken ten years after beginning of treatment showing sequestrum and new formation of bone

Sound fur-

FIG. 6



November 1912 Malignant tumor Sarcoma  
and epithelioma at site of X ray dermatitis  
in thigh

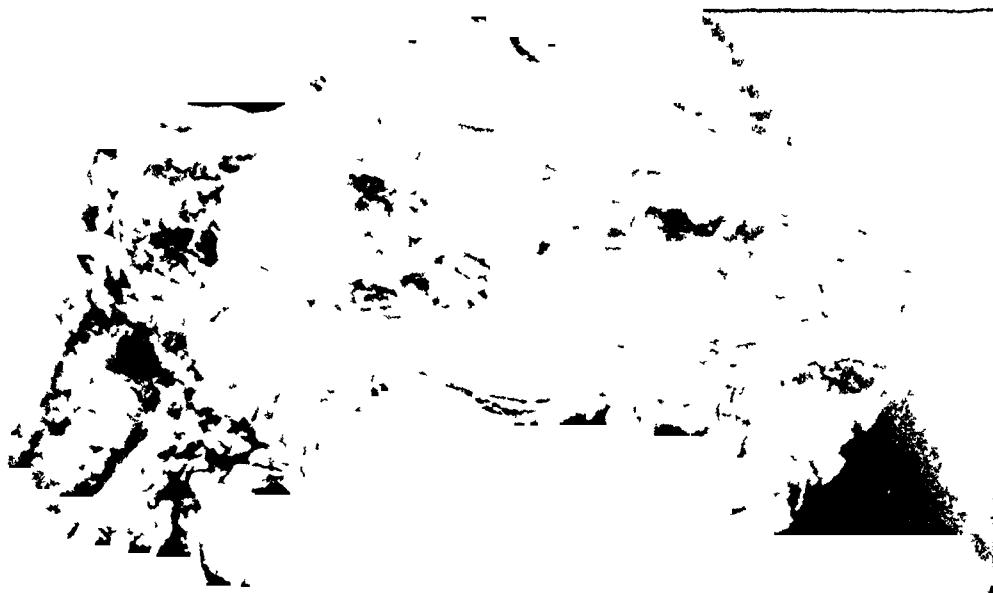
FIG. 7



January 2 1913 Showing rapid progress of disease  
in two months and appearance at time of amputa-  
tion

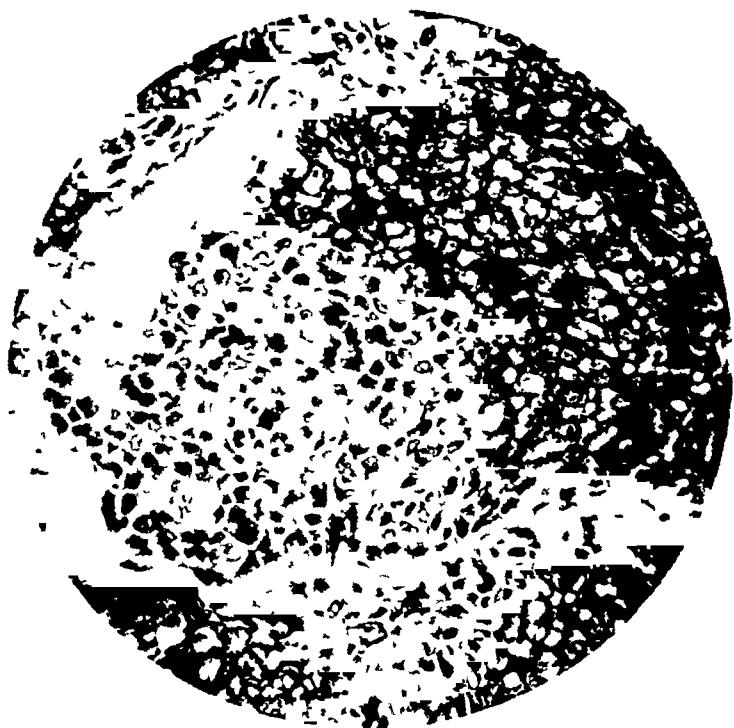
FIG. 8

a Intramedullary epithelioma

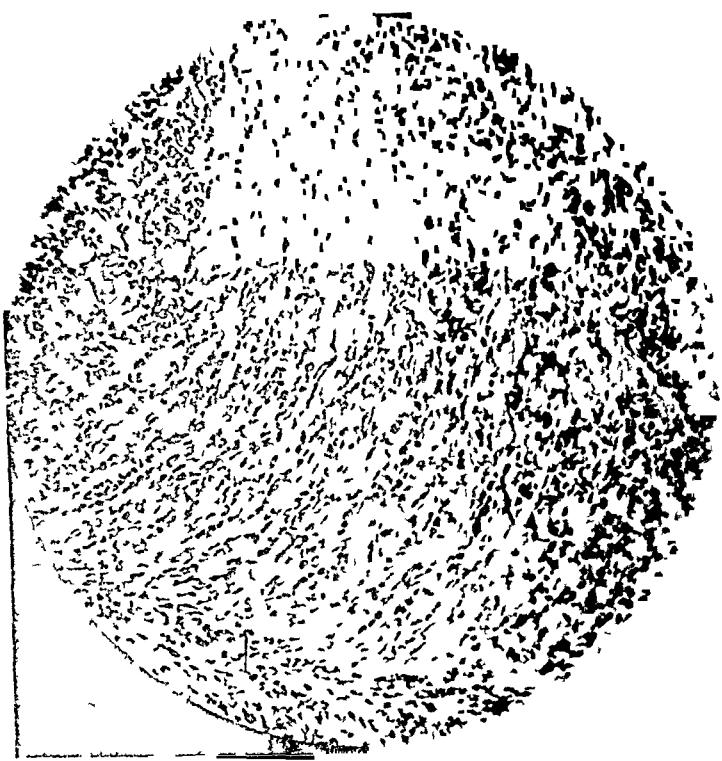


January 1913 Longitudinal section showing large intramedullary epithelioma Also bone cyst and sequestrum

FIG. 9

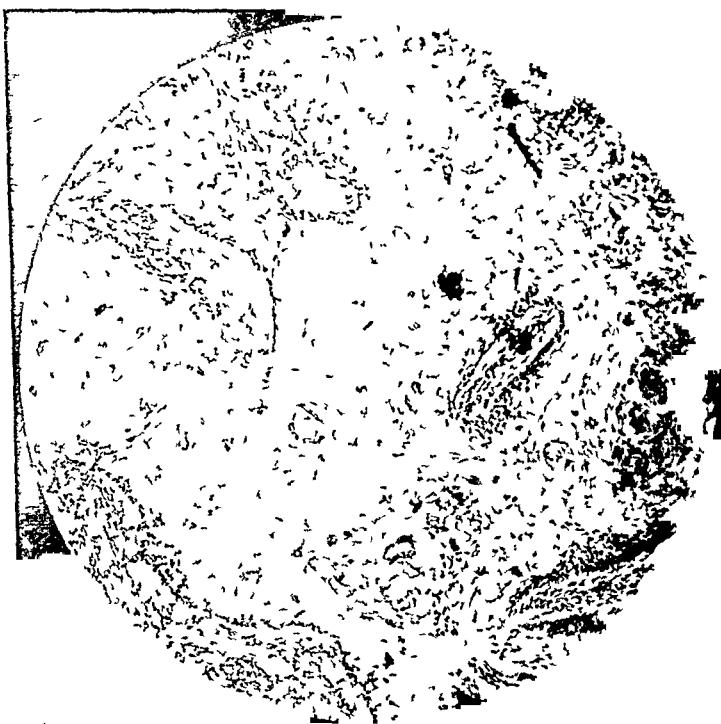


November, 1912 External tumor of thigh involving skin and muscles (sarcoma and epithelioma)



November 1912 External tumor of thigh involving skin and muscles (sarcoma and epithelioma)

FIG. 11



January 2 1913 Intramedullary tumor (epithelioma)

reports of the microscopical findings by such competent men, are, that the malignant tumor which developed in the pectoral region in April, 1912, which was undoubtedly epithelioma, was a simple example of ordinary X-ray cancer occurring at the site of an old dermatitis of ten years before The later tumor which developed in the thigh, in the autumn of 1912, started in a similar, but much more severe X-ray dermatitis, following X-ray burns of ten years before This was of a much more highly malignant nature and grew with very great rapidity The fact that it started in the skin and never—even at the time of death—reached the periosteum, strengthens the opinion that it was a new and independent tumor resulting from X-ray burns, and having no connection with the original periosteal sarcoma of ten and a half years earlier, which had apparently entirely disappeared The earlier tumor never involved the skin or muscles, and the later tumor never invaded the bone or periosteum, except the metastatic tumor in the medullary cavity which proved to be an epithelioma Part of the thigh tumor showed, according to Welch and Ewing, structures which must be classed as sarcoma Other portions of the tumor showed, according to Clark, typical basal-celled carcinoma, while the intramedullary tumor was clearly epithelioma It would appear then that we were dealing with different types of malignant disease—sarcoma, carcinoma—in the same individual and approximately at the same locality, resulting directly or indirectly from chronic irritation caused by X-rays Therefore cysts and sequestra are easily explained as the result of a rather extensive chronic osteomyelitis following the breaking down of the sarcoma of the femur under the influence of the X-rays and toxins and infection from the sinus which persisted after the large exploratory incision I have known of one other case, reported by one of the German clinics, of an X-ray worker, in which two different types of malignant tumor (one a sarcoma and the other carcinoma) occurred in the neighborhood of the wrist, following a dermatitis produced by exposure to the X-rays The two types of tumor occurred within two inches of each other (The reference to this case I am unable to find )

We are all familiar with the experimental production of sarcoma in the rat, by Marie and Clunet, published in the *Second International Congress for Cancer Research*, Paris, 1910. These investigators set out deliberately to produce a malignant tumor by producing a series of X-ray burns in the same locality, pushing the exposure to the point of ulceration, and when this had healed, repeating the experiment 4 to 5 times. At the end of this time, typical sarcoma developed at the site of the exposures.

The exact method by which X-rays produce a malignant tumor is not known. It would be idle to enter into any prolonged attempt to theorize on this question in the present paper.

I believe that X-ray cancer throws little light upon the great problem of the etiology of malignant tumors in general. It adds little to the evidence for or against the extrinsic or microbic origin of the disease. Personally, I believe it can be better explained by the parasitic theory than by any of the cellular or intrinsic theories. We should simply have to assume the existence of a widely disseminated and very generally present microorganism or virus to which nearly every individual is exposed, and yet, which under normal conditions will be successfully withheld by the resisting powers of the tissues. Under certain unusual or abnormal conditions, such as bruising of the tissues resulting from trauma, or the changes caused by chronic irritations of various sorts, including those occasioned by the X-ray, these tissues lose their normal resisting power and furnish a favorable site or nidus for the microorganisms. When once these have obtained a foothold, it will be found very difficult to control or eradicate them.

Some of those who find it difficult to explain the origin of X-ray cancer on the microbic theory, assume that the infectious agent reaches the site of development by reason of abrasions or cracks or external ulceration. If this were true, it would be hard to explain the development of cancer in cases in which there was no ulceration.

My theory is entirely different, in that I believe the infection reaches the particular locality through the blood supply, just as localized tuberculosis of bones or joints in children develops after a trauma, without any external abrasion. In these cases we must assume a latent organism present in the system, remaining harmless until the trauma so lowers the vitality of the tissues as to furnish a favorable nidus for the organism coming through the blood to gain a foothold.

Hesse, of the University Poliklinik of Bonn (*Zwanglose Abhandlungen aus d Gebiete d Med Elektiologie und Roentgenkunde, Hft 10, 1911*), has made, I believe, the most careful study of the X-ray cancer up to the present time.

Of 90 positively determined malignant tumors following the exposure to X-rays, occurring in 54 patients, 5 or 55 per cent were tumors resembling fibrosarcoma. Only one was a spindle-celled sarcoma as proven by histological examination. Hence, there was but one positive Rontgen sarcoma in the entire series.

Of 94 Rontgen lesions reported, 54 were cases of uncomplicated carcinoma, including one case of sarcoma, the latter in conjunction with "cancroids", in 13 cases the diagnosis was not absolutely certain or there were other complications, and 27 carcinomas in cases of X-rayed lupus. Twenty-six of the positive cases were observed in America, 13 in Germany, 13 in England and 2 in France.

Hesse brings out the important point that Rontgen carcinoma never develops as a simple or primary injury due to raying, but exclusively in the soil of an already present Rontgen injury.

As regards the etiology of Rontgen carcinoma, he believes that one should certainly consider the possibility of their being due to some kind of infection, either bacterial or protozoic. He states that the skin, which has been exposed to the X-rays, is full of cracks and ulcers, often as thin as tissue paper, and with little or no power of resistance, offers a favorable soil for the entrance of foreign organisms.

Against the infectious theory, he mentions the fact that

in some patients the carcinoma develops in cicatrices that had not shown any sign of inflammation for a long period, in which cases one would have to assume that the cancer germs had remained latent in the tissue and then had become active for some unknown reason Nevertheless, he states, the infectious theory cannot be excluded

With reference to therapy, he believes that limited success may be obtained by symptomatic treatment He adds "The Rontgen carcinoma itself cannot be treated radically enough, and the soil of the carcinoma cannot be treated mildly enough "

Referring to the prognosis, he states that without treatment the carcinoma invariably causes the death of the individual afflicted Under treatment the cancer as such may be cured but a *restitutio ad integrum* is impossible A complete cure of the xeroderma pigmentosum does not occur, although attempts to bring the same to a stage where it will cease to further generate carcinoma, may be successful

# A NOTE ON CANCER OF THE THYROID, AND ITS EXTENSION TO THE LUNGS BY MEANS OF THE BLOOD-VESSELS

BY FRANCIS J. SHEPHERD, M.D., F.R.C.S.E (Hon),  
OF MONTREAL, CANADA

CASES of cancer of the thyroid are always undesirable to operate on. The writer has operated on many but in very few has the result been entirely satisfactory. The majority of cases have succumbed to local extension at the site of the disease, others have had no local recurrences but have died from extension to the lungs. In only one has a satisfactory result been obtained, this was operated on some ten years ago. After a second operation for recurrence the patient became myxædematous and has been obliged to take desiccated thyroid ever since but is in good health.

In some cases the extension to the lungs is through the lymphatics, but again the transmission may be directly through the blood-vessels, as in the case reported below. This method of extension is much more common than is supposed and accounts for the rapid dissemination and termination of such cases. In the case under consideration, however, it was some years before the disease extended and for four years she continued her vocation in perfectly good health. When, however, the tumor again showed itself in the neck the growth was rapid and extension to the lungs by means of the blood-vessels quickly followed. This was strange as no glands in the neck or its neighborhood were involved, which accounts, no doubt, for the long interval of comparative health.

This case also teaches us that patients suffering from early cancer should always be operated on, for relief for a time is generally obtained. One case operated on some fifteen years ago had been under observation for a year or more, the patient steadily refusing operation. However, the growth suddenly enlarged greatly (evidently due to hemorrhage), causing great discomfort. Immediate operation showed that the sudden en-

enlargement was due to hemorrhages into a number of cysts in the gland. Convalescence was uninterrupted, but eighteen months later the patient began to spit blood and consolidation of the left lung was found. He died two months later of exhaustion due to extension of disease to the lungs and frequent hemorrhages. In this case there was no local recurrence and the extension of the disease was through the blood-vessels, the glands not being involved.

*Case Report*—Mrs D., aged thirty-nine, consulted the writer on January 13, 1907, for an enlargement of the thyroid, stating that the neck had been enlarged since childhood and only during the last four years had it grown to its present size. The tumor, which was solid, occupied the whole thyroid, the enlargement was as much on the right as on the left side and quite smooth. She wished to have the growth removed because she was breathless on exertion and had violent attacks of palpitation. Quite recently her voice had changed. She had a pulse of 120 but no other signs of Graves's disease, except great excitability, no exophthalmos, no tremors and no œdema of the extremities. Of late she had lost much weight. Operation, January 17, disclosed a tumor occupying chiefly the left lobe. The whole tumor was removed with great ease and she went home much relieved with the wound soundly healed in two weeks. The pathological report was carcinoma.

In August of the same year (1907) she reported herself quite well and said she could do more work than she had done for years. On January 4, 1911, she reported that the tumor had commenced to grow again on the left side and was of considerable size, though she felt little discomfort. On July 4, 1912, five years after the first operation, she again presented herself, at which time she was in great distress, breathing with difficulty and speaking only in a whisper. She had a tumor the size of an orange in the region of the thyroid, which was quite immovable. She begged for some operative relief so on January 6 an attempt was made to remove the growth. The patient was much emaciated and weak and had not been able to attend to her business for some months.

She took ether badly and there seemed to be obstruction low down, so a laryngeal tube was inserted. This gave no relief and

ether was discontinued and the skin was infiltrated with novocaine. The large mass on the left side was dissected out. The trachea was found flattened and pushed to the opposite side but the larynx itself was free from infiltration. The patient's condition was now so bad that it was decided to do nothing further, the right side was left alone as it was not pressing on the trachea and she was breathing quietly. The wound was closed and the patient removed to the ward. She died some twelve hours later.

The postmortem, which was performed by Dr Rhea, pathologist to the Montreal General Hospital, showed the following interesting findings:

"The thyroid gland cannot be found as such, corresponding to the site of the right lobe is a large, firm, calcified mass, 6 x 4 cm with a mass of soft tissue at the lower extremity. The trachea at this point has been displaced to the right and shows flattening on the left side. Occupying the site of the left lobe is a cavity from which a mass of tissue has been apparently removed. The tissues around the trachea are infiltrated with new growth and the phrenic and recurrent laryngeal nerves are bound down and involved by tumor tissue. The left innominate vein is enormously distended and on palpation contains a firm, irregular mass, which on opening is found to be a new growth springing from the posterior wall of the inner surface of the vein and almost occluding it."

"*Lungs*—In the superficial portions of both lungs several firm, round nodules are felt. Upon section these are found to be small metastatic tumors. They are found mostly in the lower lobes. No thrombi could be demonstrated in the veins or arteries."

"*Microscopical Description*—The tumor tissue is of the same character wherever found. The tissue consists of cords, groups of cells and acini, separated by a connective tissue stroma. The relative proportion of these elements varies somewhat in sections from different locations. The essential cell of the tumor is epithelial. These cells vary in size and shape, depending on the pressure to which they are subjected. The acini are small and most of them are empty, but some contain colloid material."

"Sections through the wall of the innominate vein and tumor attached to the inner surface show the following. The wall of the vein is thickened and attached to its inner surface is a mass of tissue consisting of tumor cells and stroma. Mediastinum and peribronchial tissues show no tumor cells."

# HYGROMA CYSTICUM COLLI

ITS STRUCTURE AND ETIOLOGY

BY CHARLES N DOWD, M.D.,

OF NEW YORK

Professor of Clinical Surgery in Columbia University,

SCATTERED through the books on surgery and pathology one may find pictures of children with enormous swellings of the neck which are described as hygromas. Although there are a few definite descriptions the statements about these growths are often indefinite, sometimes contradictory, and give evidence of having been copied from one author by another without the opportunity of extensive personal observation. At least three types of growth have been included in some of the descriptions.

1 Cystic tumors which have endothelial linings and serous contents and which grow with much power through the tissues of the neck or downward under the clavicle into the axilla or pectoral region.

2 Lymphangiomas

3 Branchial cysts

The term hydroma should be confined to the former class. They are usually described as cysts of lymphatic origin. The loculi are sometimes described as dilated lymph spaces.

The dividing line between them and lymphangiomas may not always be absolutely definite but the typical examples of each are distinct.

Since branchial cysts are now well understood one hardly sees how they need be confounded with hygromas.

The etiology of hygromas is usually referred to as unknown, although several theories for their origin have been given.

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\* Read before the American Surgical Association, May 8, 1913

These growths are rare, the total number described in surgical literature is small. Conversation with friends who would have been likely to see them indicates that they are very uncommon.

Rare cases however come in groups, and after having done neck surgery for many years without seeing a single case the writer has within the last year operated on three undoubted cases and a fourth which was probably such a case but in which inflammation had obliterated the finer structure of the cyst wall.

Most of the peculiarities which have been described in the reported cases have been present in one or more of those cases and their histories are here given in detail. The first one, a child of two and three-quarter years, gave the following history.

CASE I—J. K., age two and three-quarter years. Admitted August 22, 1912. Died Sept. 30, 1912. Nationality, U. S. (Russian). Roosevelt Hospital, History No. B3034.

*Chief Complaint*—Swelling of right neck and shoulder.

*Present Illness*—When patient was three months old the mother first noticed a small swelling, the size of the tip of the little finger, just above the middle of the clavicle on the right side of the neck. The skin over it was normal, it was not painful or tender and could be made to disappear by firm pressure downward. The lump has been gradually growing larger in spite of firm bandages, which used to make it disappear but no longer do so. Following whooping-cough last winter it grew rapidly larger. Four days before admission patient had a fall, striking the lump, since which time it has been somewhat reddened and slightly tender. Otherwise a healthy normal child. Bowels regular, appetite rather poor.

*Past History*—Has had whooping-cough, pneumonia twice, had "yellow jaundice" one year ago. Is rather subject to coughs. Had a similar lump egg-sized in right axilla, with some symptoms of reducibility, removed at a dispensary last year.

*Family History*—No history of tumors or fistulæ about the neck. No "lung trouble" in family.

*Physical Examination*—Patient is a well-nourished, healthy looking girl baby, appears restless but not ill

**Local Condition** On the right side of the neck is a globular swelling about 4 inches in diameter extending from the acromion to the anterior border of the sternomastoid and from the spine of the scapula to well in front of the clavicle. The skin over it is smooth but somewhat ecchymotic as from a contusion. On palpation it is soft, fluctuating and can be somewhat reduced in size by firm pressure. It is apparently not tender. On forced expiration there is an expansile impulse, percussion flat.

**Eyes, Ears, Nose, and Throat** Negative

**Skin** Reddish maculopapular eruptions on chest and back

**Chest** There is marked inspiratory retraction of lower ribs in front on both sides, sternum very prominent

**Lungs** Clear

**Heart** Not enlarged Sounds of good quality. There is a rough systolic murmur heard over the left half of base, transmitted upward toward both clavicles

**Abdomen** Rather a pot-belly with an umbilical hernia  
**Liver and spleen** not felt

**Extremities and Genitals** Apparently normal

**Operation** (August 23, 1912)—A transverse incision was made above the clavicle and parallel to it. The cyst was enucleated through this incision as far as the pedicle which came just in front of insertion of sternocleidomastoid muscle at the inner edge of sternum. When the cyst was opened it was found that it ran in under the sternum into the thoracic cavity but extrapleurally. It was shaped like an hour-glass and the constricted portion was large enough to admit the finger, the inner dilated portion seemed to have a content of 3-4 oz and went up as far as thyroid and downward under the sternum for about 2 inches, outward under the clavicle for an inch or more. As much of this lining membrane as could be dissected away was drawn out into the wound and cut off. No attempt was made to lay open this entire inner dilated portion, the condition of child would not warrant so extensive a procedure. Wound closed without drainage. Time of operation 45 minutes.

The recovery from the operation itself was prompt and satisfactory, but a second op-

g quickly recurred and on September

*Second Operation* (September 17, 1912) —Anæsthetic, ether  
A transverse incision was made from inner end of clavicle well back to posterior portion of neck. The skin and superficial fascia were dissected up and the cyst found to have reformed in the position where it previously existed. The prolongation which extended down under the sternum could not be found. The cyst was 3 x 4 inches long and 2 inches wide. It presented the same characteristics as the one previously removed. It was dissected out in its anterior and lower and upper portions and was found to have a pedicle which extended inward and backward and posterior to one of the scaleni muscles. After careful dissection this pedicle was divided but it frayed out and there was no evidence of an opening which extended further. The cyst contained clear serous fluid, there was considerable fatty tissue on its outer side, also some lymphatic tissue. The wall was thin and similar to one previously removed. There was no evidence of epithelium or communication with the deeper structures.

The child showed considerable reaction after the second operation. There was free serous discharge, on the seventh day there was hemorrhage from the wound, some oozing on the following day and on the tenth day she died.

*Pathologist's Report* (R H Pat No B-506) —J K, August 23, 1912  
Specimen Cyst wall

Gross Examination Specimen consists of a thin-walled smooth cyst, with an opening about 2 cm in diameter at one end. Some areas are red in color, others thin and upon holding to light are translucent. A small thin-walled cyst containing a few drops of serous fluid was found within the cyst wall.

Microscopic Examination Section shows a thick-walled cyst which is involved in a chronic inflammatory reaction. There is an increase in fibrous connective tissue especially around the blood-vessels which are numerous. Areolar tissue is present in the outer portions in which there are scattered aggregations of lymphoid follicles. No definite type of cell can be made out lining the cyst though in some places they have the appearance of much flattened endothelial cells. This inner part of the wall shows a marked infiltration of round cells.

Diagnosis Chronic inflammation of cyst wall

Pathologist, Baldwin Mann, M D

*Pathologist's Report*, second specimen (R H No B-786) —J K, age two and three quarter years, Sept 17, 1912

Specimen Cyst

*Physical Examination*—Patient is a well-nourished, healthy looking girl baby, appears restless but not ill

**Local Condition** On the right side of the neck is a globular swelling about 4 inches in diameter extending from the acromion to the anterior border of the sternomastoid and from the spine of the scapula to well in front of the clavicle. The skin over it is smooth but somewhat ecchymotic as from a contusion. On palpation it is soft, fluctuating and can be somewhat reduced in size by firm pressure. It is apparently not tender. On forced expiration there is an expansile impulse, percussion flat.

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The recovery from the operation itself was prompt and satisfactory, but the swelling quickly recurred and on September 17, a second operation was done.

*Second Operation* (September 17, 1912) —Anæsthetic, ether A transverse incision was made from inner end of clavicle well back to posterior portion of neck. The skin and superficial fascia were dissected up and the cyst found to have reformed in the position where it previously existed. The prolongation which extended down under the sternum could not be found. The cyst was 3 x 4 inches long and 2 inches wide. It presented the same characteristics as the one previously removed. It was dissected out in its anterior and lower and upper portions and was found to have a pedicle which extended inward and backward and posterior to one of the scaleni muscles. After careful dissection this pedicle was divided but it frayed out and there was no evidence of an opening which extended further. The cyst contained clear serous fluid, there was considerable fatty tissue on its outer side, also some lymphatic tissue. The wall was thin and similar to one previously removed. There was no evidence of epithelium or communication with the deeper structures.

The child showed considerable reaction after the second operation. There was free serous discharge, on the seventh day there was hemorrhage from the wound, some oozing on the following day and on the tenth day she died.

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Diagnosis Chronic inflammation of cyst wall

Pathologist, Baldwin Mann, M D

*Pathologist's Report*, second specimen (R H No B-786) —J K, age two and three quarter years, Sept 17, 1912

Specimen Cyst

**Gross Examination** Specimen consists of a mass of fibrous and fatty tissue containing a few lymph nodes, and a small smooth lining of a cyst

**Microscopic Examination** Section is composed of muscle and connective tissue, containing numerous rather congested blood-vessels, considerable fat and a few nerves. Round cell infiltration is present throughout. There is a definite cyst lined by a single or double layer of rather large cells with elongated nuclei. Lymph node shows moderate hyperplasia.

**Diagnosis** Cyst wall showing chronic inflammation. Moderate hyperplasia of lymph node.

Pathologist, Mortimer Warren, M.D.

**CASE II—J A**, age twenty months St Mary's Free Hospital for Children History No S 10979 January 18, 1913 Sent by Dr John McBarron Ever since birth the mother had noticed what she called a "bubble" just beneath the left clavicle. This apparently diminished on pressure and the mother had not noticed any apparent change in it until two weeks or so ago. Then decided enlargement appeared over the upper left side of the chest in front. The child was sent to the hospital and found to have a very prominent cystic tumor in this locality. Just beneath the clavicle the cyst seemed thin walled, further down it had apparently thicker walls. It extended from the sternum to the outer edge of the pectoralis major and from the sixth rib to the clavicle.

The child's parents were first cousins and the entire family of six children had been defective in some way. This one seems idiotic. It was impossible to keep him quiet long enough to get a good picture of him and finally the picture had to be taken while he was under an anæsthetic.

**Operation** (January 21)—A curved incision with its convexity outward was made from above the clavicle to the sixth rib and axillary line. The pectoralis major was found to be in front of the cyst. Its fibres were therefore split with the hope of extracting the cyst through this split, this however was not possible. It was found that a portion of the cyst projected between the upper fibres of the pectoralis major and the clavicle. Finally the entire width of the pectoralis major was divided. The cyst was then found to press forward from beneath the clavicle. The axillary vessels and the brachial plexus were pushed forward. The cyst had extended beneath the pectoralis minor, and also in front of it so that it enveloped it. It

was multilocular, the locules having walls of different thicknesses and varying in size from a pullet's egg down. In some places the walls were very thin indeed so that these cysts ruptured on pressure. It was found that this growth extended well upward into the neck, portions of it being found beneath the lower portion of the sternomastoid muscle. The general appearance of the growth at the time of operation is indicated in Fig 7, which was constructed from a sketch made by Dr E H Pool at the time of operation. The cysts which broke contained thin serous fluid slightly yellowish in tinge. The growth extended over so far to the left as to involve the capsule of the shoulder-joint, and in the course of the dissection this joint was opened. It was manifest that it had the power of independent growth. The manner in which the clavicle was pushed forward, the axillary vessels and the brachial plexus were separated from it, the pectoralis major was pushed forward under strong tension, the pectoralis minor was enveloped both in front and behind, all gave evidence of a mass which was pushing its way along these tissues and following the line of least resistance.

This child made a reasonably good recovery from the operation and went home in a month.

At a later time in the winter he developed a sore throat with laryngeal obstruction and died.

Dr Win C. Clarke, the pathologist of the hospital, was present at the operation and stained a part of the cyst wall with protargol as soon as it was removed, thus hoping to determine the character of the lining cells. A very beautiful endothelial lining was thus shown (Fig 8). His report is here given.

*Pathological Report—J A, 2293 February 5, 1913*

Gross Examination Specimen consists of a sharply outlined lobulated oval tumor mass measuring 6 x 8 cm. Attached to this mass are two collapsed sacs of tissue, their walls are at points thin, elsewhere reinforced by considerable adventitious tissue.

Extending inward from the walls of the cavities are folds or reduplications that form compartments. These compartments or recesses connect with the main cavities of the sacs and are also crossed by numerous trabeculae. There are other smaller cysts in these partitions. The content of these smaller unopened cysts is straw colored fluid.

The lining membrane of all the cavities is smooth and glistening. The substance of the sac wall is soft and resilient. This tissue is red, does not contain exudate, and there are no inflammatory signs present.

The uncollapsed mass on cut section is also found to be a cyst. The walls are 0.4 cm in thickness. The tissue forming the wall is light in color and contains a small amount of inflammatory exudate. The cyst itself contains coagulated, clear, jelly-like exudate with radiating striations in the mass. This coagulated exudate is firmly adherent to the lining of the cyst cavity. Because of this, the lining of the wall is roughened and shaggy in appearance, not smooth and glistening as in the other cysts of the specimen. This portion of the specimen suggests that the cyst wall had been recently inflamed. Since the exudate as it poured out contained fibrinogen, fibrin was thrown down and the jelly-like coagulum resulted.

**Microscopic Examination** Flat sections were stripped from the lining of the cyst cavities and were impregnated with protargol. Following precipitation of the silver salt in the sunshine, it was found that all but the cyst that contained coagulated exudate was lined by completely specialized endothelium.

The salt was precipitated in such a manner that a mosaic, was formed of black lines of silver. This mosaic defined the margins of the lining cells, showing that they covered the surface in an even and distinct layer characteristic of the lining endothelium of established blood or lymph channels, and not characteristic of connective tissue lined cavities, as in a joint or bursa for example.

Sections from wall of uncollapsed cyst show a definite connective tissue stroma resting on striated muscle bundles. The lining of the cyst is covered by dense masses of fibrin in the meshes of which are many leucocytes and well preserved red blood cells. The actual lining cells of the cyst are elongated fibroblasts which infiltrate the attached fibrin. Where the fibrin is deficient the lining cells are flattened and evenly disposed with no tendency to project outward into the cyst cavity.

Sections from the walls of the sacs which had contained clear fluid show that the cells are flattened out and present a distinct cell wall corresponding to the tangential sections of the silver preparations. At points in the cyst walls are many cavities containing dense masses of red blood cells and apparently no fibrin. The outline of these cavities is sharp and distinct with no tendency on the part of the lining cells to grow in among the red blood cells.

Pathologist, William C Clarke, M.D.

**CASE III**—W F, aged eleven months St Mary's Free Hospital for Children, History No S 10949 Jan 18, 1913 Patient sent by Dr Leonard Adair. At birth a slight protrusion was noticed on right side of neck. It has been gradually increasing, especially since a cold appeared ten days ago. Now there is a large cystic swelling on the right side of neck extending from clavicle, acromion and border of scapula up two-thirds of the way to ear, looks as though it contains 6 oz of fluid. Child looks

fairly well nourished. The child went to the hospital with a temperature of  $103^{\circ}$ , this temperature subsided, but at the time of operation he had a temperature of  $101^{\circ}$

*Operation* (January 21) — A long transverse incision was made and the fatty subcutaneous tissue was found to be oedematous. The cyst wall was not as definitely limited as if this oedema had not existed but it was fairly well dissected out. It extended forward to the sternomastoid muscle above the clavicle and behind its border. It extended backward under the trapezius and was so intimately adherent to the scaleni muscles that they were separated from it with great difficulty. Some of the branches of the cervical plexus were adherent in the wall of the growth. The posterior branch of the eleventh nerve could not be found.

An opening was made into the cyst wall fairly early in the operation and several ounces of pus exuded, this was reasonably thick, greenish in color and contained no coagulae. When the mass was removed a smooth friable lining was found in its cavity. There were no lymph nodes apparent. The wound was partially closed, and drained. It healed satisfactorily and the child left the hospital two weeks after the operation.

Bacteriological examination of the pus showed both pneumococci and streptococci.

The microscopical examination of the cyst wall is given below.

*Pathological Report* — W F, 2292 February 5, 1913

Gross Examination Specimen consists of a sac wall the outer structures of which are fat and recent tissue. At one point the wall is distinct and free from fat.

The sac wall over the larger part of the specimen is 1 cm in thickness diminishing from this extreme measurement to 2 mm.

The inner surface is exceedingly smooth and presents several folds and trabeculae which partially subdivide the cavity. This inner lining is also exceedingly friable.

Cut section of the more solid portions of the wall show that there are two minute white areas in the lining of the main cavity. The tissue itself is yellowish pink with areas of fat.

There are no areas of definite degeneration. Sections of wall removed in fresh state and impregnated with protargol. After precipitation of the silver salt by sunshine, microscopic examination of lining showed that there were indifferent markings of silver but no distinct cell outline.

Hæmatoxylin and eosin stain of cross section of cyst wall shows that

it consists of granulation tissue. This granulation tissue is infiltrated with countless leucocytes and fibrin strands.

There are no areas of degeneration, no giant-cells and no epithelioid cells.

Microscopic examination of lymph node adjacent to cyst wall shows simple hyperplasia.

Diagnosis Cyst of neck acute inflammation

Pathologist, William C Clarke, M.D.

CASE IV—J. F., aged two years St. Mary's Free Hospital for Children, History No S 11450 April 1, 1913 At birth there had been a slight "bubble like" swelling in the left side of the child's neck. This had increased during the last few months and had been treated by several doctors. One of them had drawn off considerable clear fluid by aspiration but the cyst had quickly filled again.

*Physical Examination*—There was a cystic tumor on the left side of the neck which extended from behind the sternomastoid muscle forward almost to the median line and from the mastoid process nearly to the clavicle. This was very near the skin in some places and was apparently very thin walled. It fluctuated on pressure, there was no inflammation and the skin was not discolored over it.

*Operation* (April 1, 1913)—Transverse incision which had to be carried across the sternomastoid muscle. This muscle was divided. The cyst was multilocular, very thin walled, dark looking in places and extended up into the interstices of that portion of the neck. In removing it the internal carotid and internal jugular veins had to be separated for two inches or more. The internal jugular vein was liberated from it with great difficulty as it was densely adherent to it. The pneumogastric, phrenic and spinal accessory nerves were exposed for long distances. The cyst walls were attached firmly to the deep aponeurotic structures of the neck and the dissection went well down to the transverse processes of the cervical vertebrae, exposing the branches of the cervical plexus as well as the nerves previously mentioned. Apparently it was completely removed, but certain portions of the hygroma were so thin walled and the loculae so small that their delicate structure could not always be distinguished from the normal tissues and it is possible that some little portions remained behind.

Wound was closed and child made a good recovery

*Pathological Report*—J F, age two years Specimen No 2444  
St M, No 1371 April 2, 1913

Gross Examination Specimen consists of a sharply outlined lobulated tumor mass somewhat oval in shape and measuring about  $55 + 4$  cm Extending from the surface of this mass are a number of small thin and transparent walled cysts which in one area are joined together forming a chain These small cysts are bound together as well as to the main tumor mass by strong bands of adventitious tissue Attached to the tumor are two greatly enlarged lymph nodes

The main cavity of cyst is divided by means of folds into a series of smaller cavities or compartments Traversing these compartments are a number of fine strands or trabeculae The cysts contained a thin serous straw colored fluid

The main cyst is lined by a smooth, glistening, pearly membrane The sac wall is soft, elastic and very dense

On sectioning one of the uncollapsed and smaller cysts the wall, though very thin, is found to be extremely dense and containing under considerable pressure a thin serous fluid

The lining membrane of these cysts is similar to that of the larger one, namely, consisting of a pearly white membrane very smooth and glistening There is no inflammatory reaction around the tumor Specimen dissected from lining wall of cyst was impregnated with protargol

Microscopic Examination Tangential sections show the silver salts deposited in the intercellular cement substance giving to the tissue a mosaic appearance The cells are seen to be highly specialized endothelial, similar to that seen lining the inner surface of blood and lymph vessels The cyst wall is composed of a very definite connective tissue stroma, with no signs of inflammation

Diagnosis Hygroma

Pathologist, Wm C Clarke, M D

One who studies these cysts must be impressed by two facts.

1 Their endothelial structure and multilocular development differentiate them from any of the other growths which are found in this locality

2 They had an independent power of growth which was sufficient to force them with great power into the surrounding tissues

The beautiful endothelial cells which existed in the second and fourth cases are shown in Figs 8, 14 and 15, and a cross section of the endothelial structure which existed in the first case is shown in Fig 3 Although a cross section does not show all the details of endothelium the cyst lining shown in

Fig 3 very closely resembles that shown in Fig 9. These linings differ from the epithelial linings which are found in branchial cysts and do not correspond to the tumors which are found in connection with ordinary lymph nodes. The structure is much more definite than one would find in an ordinary malignant tumor. The endothelial structure resembles that which is found in lymphatic vessels or in certain blood-vessels. It does not look like that which is found in joints or bursæ or which is developed in ordinary connective tissue.

We may dwell a little more at length on the enormous growing power which these cysts showed. The first one had worked its way forward above the clavicle and pushing around the internal border of the sternomastoid muscle had pushed downward behind the clavicle and behind the sternum, forming a saddle bag shaped cyst. When the child coughed and forced the fluid from the internal into the external part of this cyst the effect was startling. The external part of this cyst is indicated in Figs 1 and 2. The communication between the two parts was large enough to easily admit the finger and the internal part extended for a wide distance behind the sternum into the mediastinum. The pressure force which carried it there must have been very great. When the external part of the cyst was removed and the pressure thus relieved, its internal part collapsed and healed and was not to be found at the second operation.

The growing power was shown again by the rapid recurrence between the two operations. Apparently all but the mediastinal part of the growth had been removed at the first operation, yet at the second operation, twenty-five days later, there was a multilocular thin walled cyst almost as large as the first one. The growth was as rapid as that of a very malignant tumor. The growth of the cyst in the second case had progressed with similar force. The way in which it pressed down into the axilla and enveloped the pectoralis minor muscle was remarkable. The first one formed a saddle bag cyst around the sternomastoid muscle, the second one formed a similar saddle bag cyst around the pectoralis minor muscle and pushed the pectoralis major forward so as to make

FIG 1



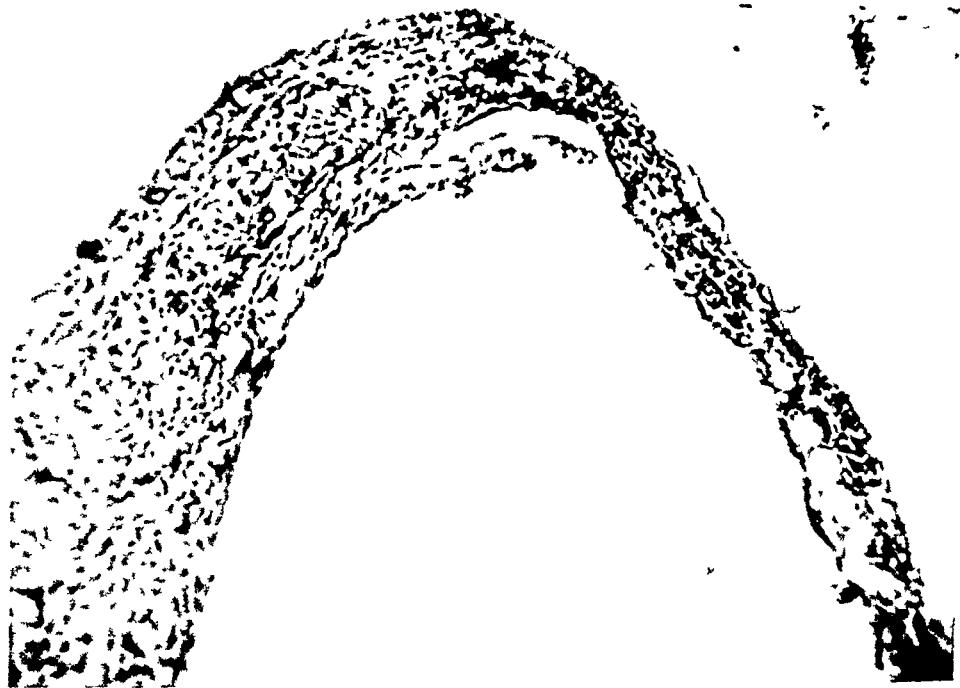
Cystic hygroma of neck. This cyst was multilocular. One portion extended around the lower inner border of the sternomastoid muscle into the mediastinum and formed a saddle-bag shaped cyst. Expansion could be noticed in the outer part when the child coughed. It contained clear fluid and was apparently lined with endothelium.

FIG 2



Posterior view of cyst shown in Fig 1

FIG. 3



Cross-section of cyst wall Case I showing lining which is believed to be endothelium a fibrous cyst wall and round cell infiltration

FIG. 4



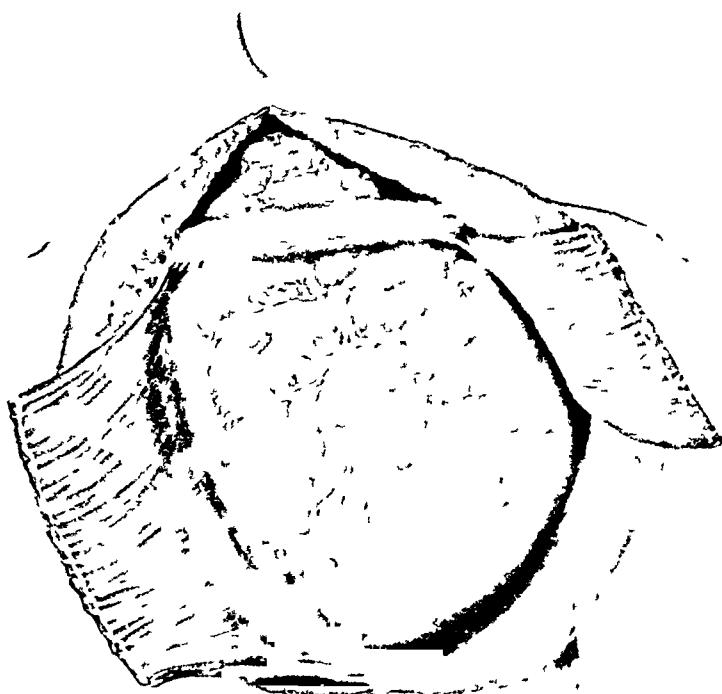
Case II Cystic hygroma of neck and chest The iodine mark indicates the boundaries of the cyst

FIG 5



Case II Cystic hygroma of neck and chest side view The growth extended under the pectoralis major muscle and pushed it forward

FIG 6



Case II Diagram of cyst from drawing made at time of operation (b Dr Eugene H Pool) The pectoralis major muscle has been divided and laid back from each side so as to expose the cyst *in situ* The thoracic portion of the cyst seemed more solid than the cervical portion

FIG. 7

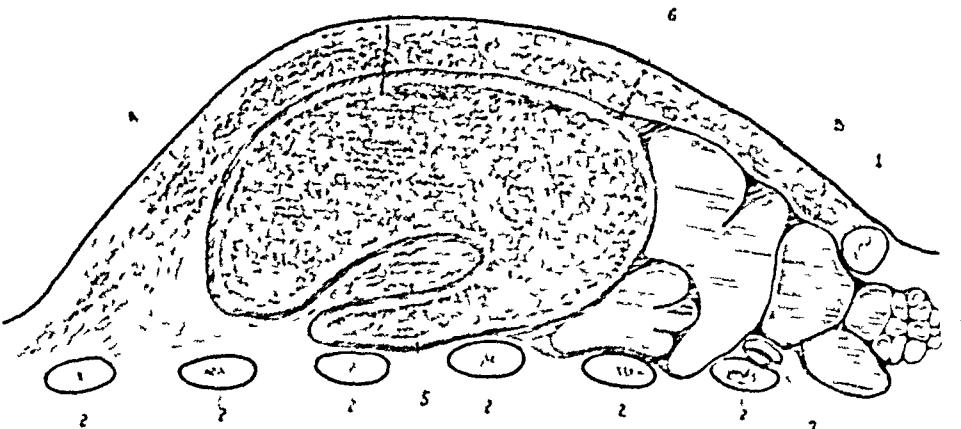
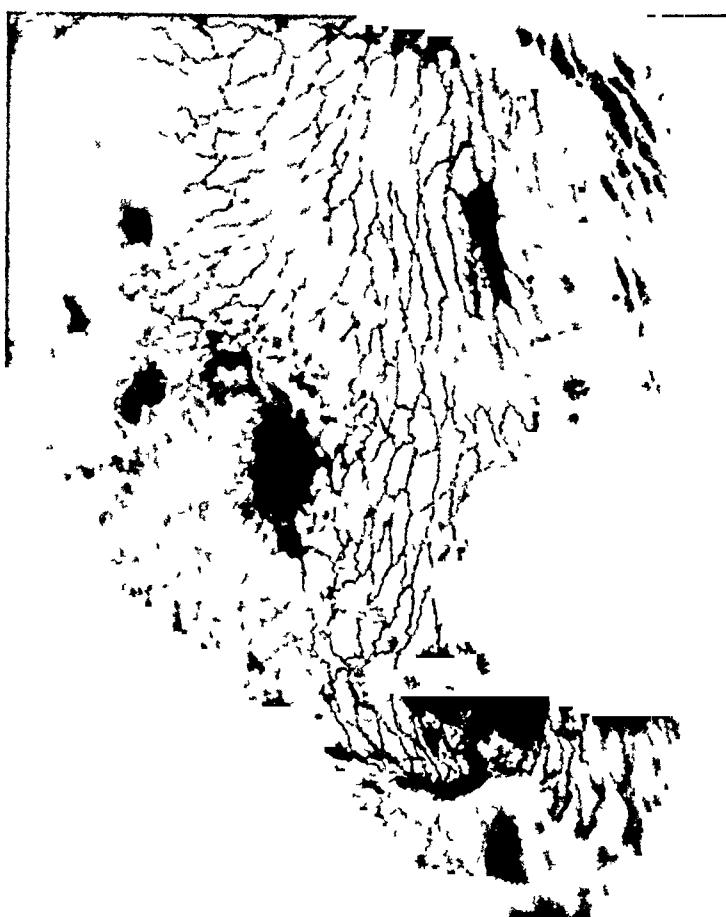


Diagram of vertical section of anterior chest wall and hystrionis. (From drawing made by Dr. Wm. T. Clarke.) 1. Clavicle. 2. rib. 3. axillary vein. 4. pectoralis major muscle. 5. pectoralis minor muscle. 6. wall of cystic hystrionis. 7. small cysts in neck. 8. larger cysts between clavicle and chest wall. C, cyst which had pushed in front and behind pectoralis minor muscle in saddle-bag shape. These are coeci and small round cell infiltration in the wall of the portion of the cyst which had pushed in front and behind pectoralis minor muscle. Inflammation is thus indicated.

FIG. 8



Case II Cyst lining stained with protargol showing delicate outlining of endothelial cells

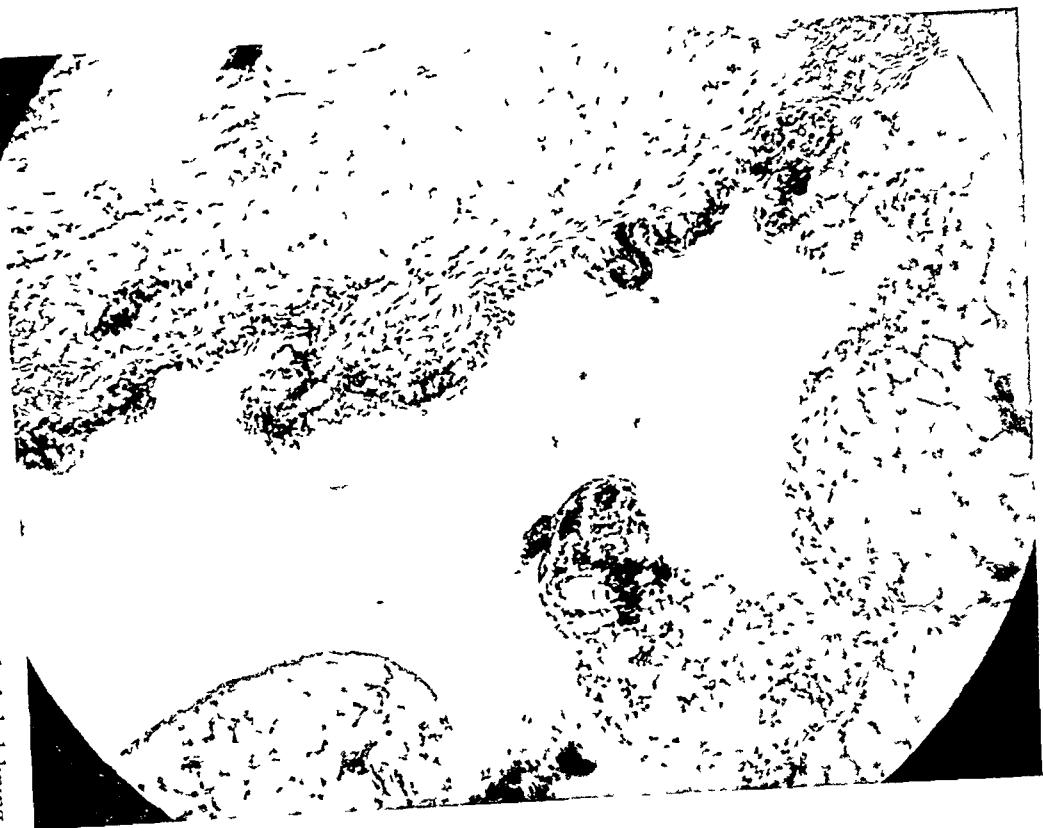


FIG. 9



FIG. 10

Case II Cross section of cyst wall showing endothelial lining, fibrous structure of wall and slight round-cell infiltration. This section is very similar to Fig. 3

Case III Believed to be hygroma of neck in which inflammatory changes had occurred. The history of the patient and the appearance of the cyst indicated "hygroma", but inflammation had so changed the cyst walls and contents that the original structure could not be definitely determined

FIG II



Case III Cyst wall showing extensive infiltration and small round cell infiltration and dissection of the cyst lining



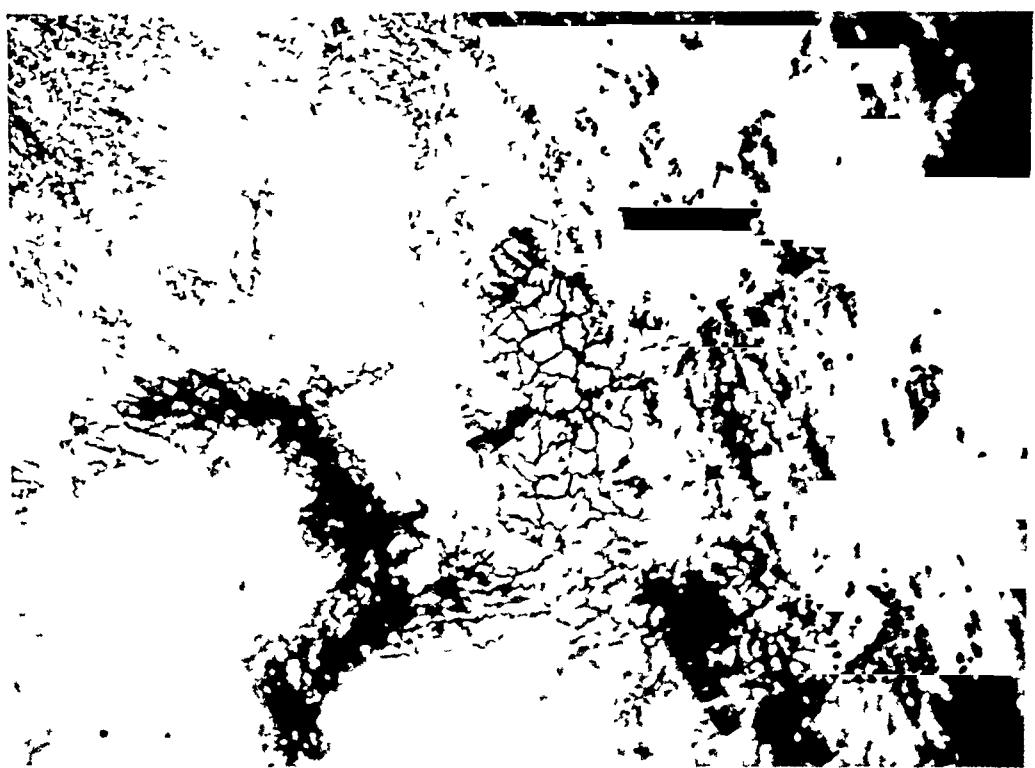
FIG I.

Case IV Cystic hygroma of neck. Child aged two years.  
A small cyst was present at birth and has recently increased in size. Clear fluid is recenty been aspirated from the growth and contains a thin, watery fluid.

FIG. 13

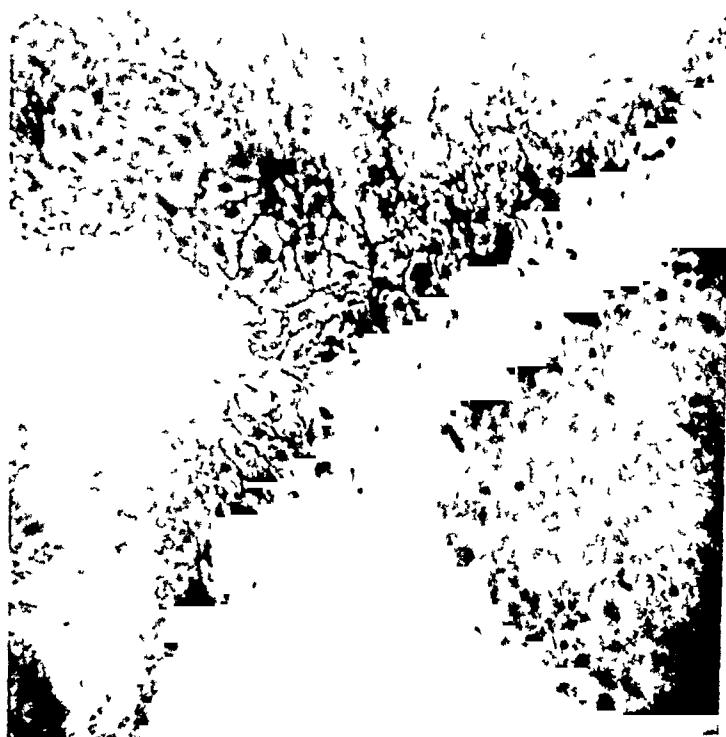


Case IV Rear view



Microphotograph of portion of cyst wall from Case IV. The outer lines of the endothelial cells are marked by protruding tu

FIG. 15.



Portion of cyst wall from Case IV. The outlines of the endothelial cells are stained by protargol, their nuclei are stained by haematoxylin

a great protusion on the anterior chest wall (See Figs 4, 5 and 6)

The peculiarities of the cyst growth were well shown in the second case. The translucent loculi, which apparently were the most recently formed, contained clear serum and had very thin walls with delicate endothelial lining, on the other hand, there was at least one other loculus which showed in its wall inflammatory infiltration of small round cells and the presence of cocci, its contents were coagulated and jelly-like

The wall of the cyst in the first case also showed inflammatory thickening

The presence of inflammation in the walls of these two cysts suggests an explanation for the more extensive inflammation in the wall of the cyst in the third case

All of these cysts corresponded to the ordinary method of development which has been described, in that there was a small bubble-like growth at birth which was almost quiescent for many months and which then took on rapid growth

*Etiology*—One's curiosity must be excited by the presence of these cysts In order to explain them one must account for cystic lymphatic tissue which was present at birth, which was nearly quiescent for a long period and which then took on rapid forceful growth

Max Borst,<sup>1</sup> has given a résumé of our knowledge on the subject He states that their cause is not entirely clear Luschka and Boucher consider them as arising from the intercarotid ganglion Arnold opposed this and thought it a cystic development of the connective tissue Others thought they were connected with the thyroid Gurlt and Rohitansky, a subcutaneous hydrops Lucke, Koster, Klelos, an endothelial cyst arising from lymph vessels

He suggests the presence of a congenital sequestration as the cause

Arnold<sup>2</sup> who studied the subject most thoroughly as far back as 1865 thought that a congenital defect underlay the condition

<sup>1</sup> Die Lehre von den Geschwulsten, Weisbaden, 1902, p 204

<sup>2</sup> Virchow's Archiv, 1865

It is to this theory of an embryonic sequestration that I will particularly ask attention. A sequestration of lymphatic tissue which had in it an independent power of irregular growth offers a satisfactory explanation for all the conditions found

It is unnecessary before this audience to review the entire question of embryonal sequestrations or rests. All here know that in the growth of the body fragments may be separated from the main portion of any one of the organs and that the closure of embryonic ducts or the development of other embryonic structures may be incomplete. The sequestrations or rests thus remaining may under certain conditions develop in irregular ways. Thyroglossal, branchial, dermoid, ovarian, parovarian, mesenteric or urachal cysts may be examples of such growth. Sometimes the growth seems little more than the distention of closed ducts owing to the activity of the epithelial cells which line it. At other times the growth is more active than this, e.g., the semi-malignant growth of misplaced portions of the suprarenal bodies.

If we study the comparative anatomy of the lymphatic system we find many reasons for expecting occasional lymphatic rests. In fishes<sup>3</sup> for instance the lymph vessels are not so plainly differentiated from the venous system as in the higher forms—a lymph sinus connected with a vein occurs on either side in the scapular region and into it lymphatic trunks from the head and body open.

Huntington, of Columbia, and McClure, of Princeton, have given much study to the comparative anatomy of the lymphatic system. The jugular lymph sac, depicted in Fig 16, is a structure found in many animals and might well give rise to a sequestration in its development.

Professor McClure who has seen some of my specimens writes as follows:

"I think there can be no doubt about the cystic growths you speak of being due to embryonic sequestrations of lymphatic tissue."

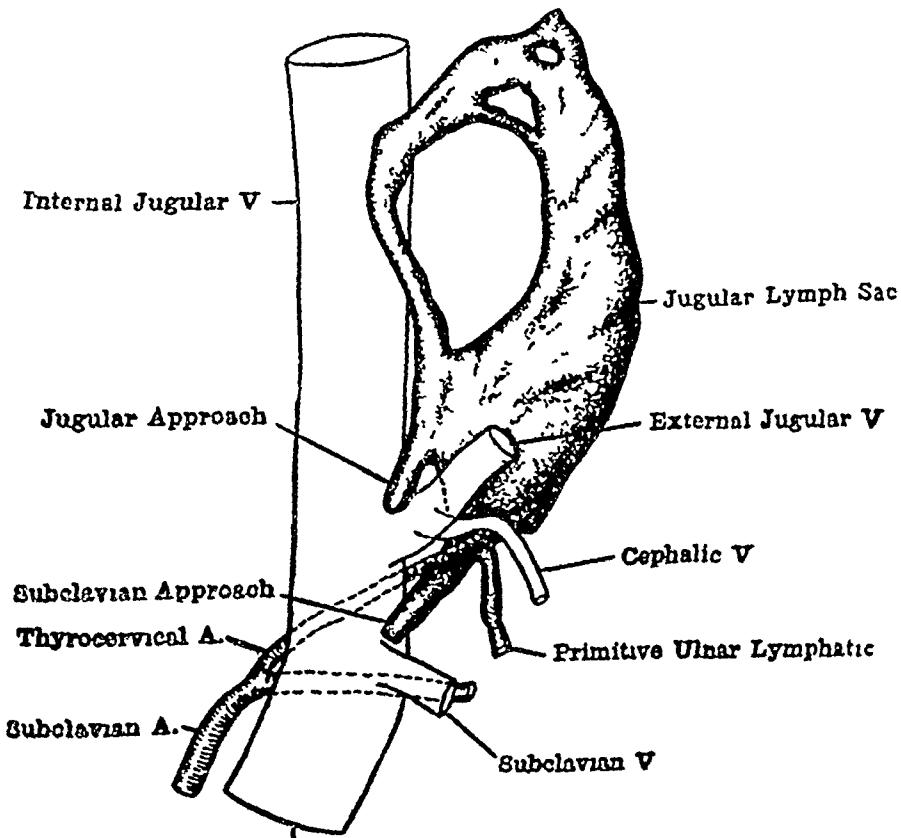
<sup>3</sup> Wiedersheim, Comparative anatomy of Invertebrates, MacMillan, 1907, p 432

" Both Huntington and I have found that the lymphatics in the neck region of mammals develop as independent structures which secondarily connect with the veins. In certain cases some of these independent structures may never join the vein and give rise to the structure you mention. I have found the same condition in fishes, so one may regard this principle of development as uniform for vertebrates in general."

Fig 17 shows an arrangement well adapted for the production of sequestrations.

The literature of the subject of hygromas throws much

FIG 16



A reconstruction of the left jugular lymph sac of a 11 mm cat embryo (*Felis domesticus*)  
Reproduced from Anatomical Record, vol III, p 535 (McClure and Silvester)

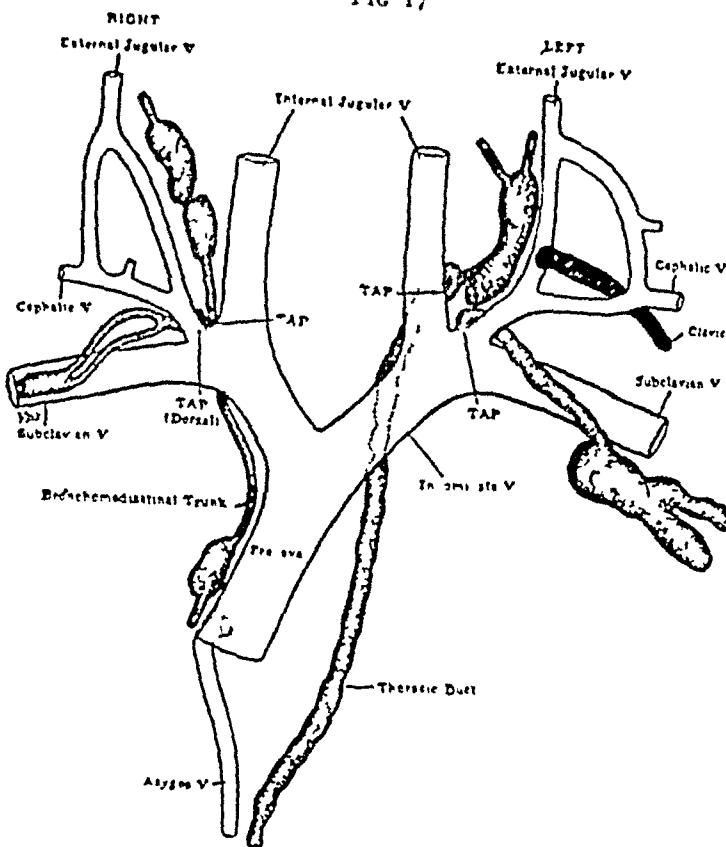
light on the peculiarities of their occurrence and strengthens our belief in the method of development above given

Dr Farr has made out the following tables endeavoring to include only those cases which were definitely hygromas, according to the definition above given. It is not possible to make a list which is altogether satisfactory, e.g., in only 15 of the 91 cases in the first table is there a definite state-

ment of the endothelial lining of the cysts and we do not know how well the staining was done in most of these 15 cases

The group division here given is about what would be expected. The neck is the part of the body most richly supplied with lymphatics and hence the most common site of these

FIG. 17



Showing the structure of the lymphatics and their communications with the veins in the vol III, p 551 Fig 9 (type II) (McClure and Silvester)

growths. The axilla which also has a rich lymphatic supply shows the next largest number. Without doubt some of the axillary growths pressed through from the neck as in the writer's second case or were associated with the neck cysts as in Case I.

It is a little strange that so few cases are reported in the groin but there are enough to establish their existence.

It is also noteworthy that so little of the literature is recent. Most of the recent cases are described under the

HYGROMA CYSTICUM COMPLEX

Table of Reported Cases of Hygroma

No	Author	Age	Sex	R L	Operation	Autopsy	Result	Contents	Uro- lithia- tar	Multi- locu- lar	Endo- the- hum	Reference
1	Arnold	1 wk	M	+					+			
2	Arnold	Postus	M	++					+			
3	Hawkins	8 mo	M	++					+			
4	Hawkins	1 yr	F	+	Repeated puncture	+	d	c				Virchow, Archiv, 1805 Jhd 31 p 300
5	Hawkins	1 yr	F	+	Puncture and excision	+	d	?				Virchow, Archiv, 1805 Jhd 31 p 300
6	Arrott	1 mo	F	+	None	+	d	+				Medico-Chir. Arch., 1839, v. 1, p. 399
7	Neaton	N B	M	+	Puncture and excision	+	c	c				Medico-Chir. Arch., 1839, v. 1, p. 399
8	Loram	N B	M	+	Puncture and excision	+	c	+				London M. Gazette No. 3, v. 1, 1839
9	Storch	4 wks	M	+	None	+	d	+				Porter's Chir., 1839, p. 231
10	Bruch	N B	M	+	Punctures	+	d	+				London Med. J. May, 1850, p. 68
11	Evans	1 yr	M	+	Seton	+	d	+				Leitachi f. Rati-med., Bd. 9, p. 780
12		3 mos			Incision	+	c	+				Gazette d. Höpt., 1851 No 78, p. 310
13	Roux				Excision	+	d	+				Gaz. med. d. Parv. 3 Ser. I VIII 1853
14	Gilles				Excision	+	d	+				f. Kinderkrankheiten, 1861, p. 68
15	Roux				Injection iodine	+	c	+				Ruc. Med. chir., 1855
16	Roux	8 d	M	+	Injection iodine	+	d	+				Dissertation Bonn, 1852
17	Ebermayer	15 mos	F	++	None	+	c	+				Bull. Gen. de Therap. v. 51, p. 155
18	Wützer	2 mos	M	++	None	+	d	+			Bull. Gen. de Therap. v. 51, p. 450	
19	Volckers	11 d	F	++	Puncture	+	d	+			Caspar's Wein, 1836, p. 13	
20	Bednar	14 d	F	++	Incision	+	d	+			Caspar's Wein, 1836, p. 257	
21	Bouchut	55 d	O	++	O	+	d	+			Caspar's Wein, 1837, p. 704	
22	Berend	21 d	M	++	Puncture and	+	d	+			Krankheit der Neugebor., 1850	
23	Ebert	12 w	M	++	iodine	+	d	+			Kinderkrankheiten, 1851, p. 780	
24	Ammon	7 yrs	M	+	Puncture and	+	d	+			Med. Zentral-Zeit., 1861, p. 286	
25	Droste	N B	F	+	iodine	+	d	+			Med. Zentral-Zeit., 1861, p. 286	
26	Schuh	22 yr	M	+	Red serum	0	d	+			Angeboren Chir. Krankheit, 1842	
27	Schuh	N B	F	+	Seton	+	c	+			P. 54	
28	Wernher	mos	M	+	Partial excision	+	c	+			Halsleib Hannover Annal., 1839, p. 205	
29	Ammon	1 yr	M	+	Excision	+	d	+			Wien. Med. Woch., 1863, v. 13, p. 612	
30	Redenbacher		M	+	Spont. rupture	+	d	+			Path. and Therap. d. Pseudoplasmod., 1854, p. 196	
31	Otto		M	++	O	+	c	+			Angeborene Cystenlygrome, 1843	
32	Jackson	3 yrs	M	++	Excision	+	d	+			Angeb. Chir. Krankheit, 1892, p. 57	
33	Gurtt	Fœtus	M	++	Puncture	+	d	+			Diss. München, 1828	
34	Gurtt		M	++			d	+			Most Sekund. Vraut., 1841	
35			R	++			d	+			Am. Jr. Med. Sel., 1861, p. 101	
							d	+			Cyst. Geschwulst des Halses, 1855	
							d	+			Cyst. Geschwulst des Halses, 1855	
							d	+			Cyst. Geschwulst des Halses, 1855	

## HYGROMA CYSTICUM COLLII—Continued.

No.	Author	Age	Sex	R	L	Operation	Result	Autopsy	Contents	Multilocular	Cyst Wall	Reference
36	Bednar	N B	P	+	Puncture and Seton	d	+	Serum	+	+	+	Krankheiten des Neugeborenen, 1850
37	Adelman	5 wk.	M	+	Excision	c	+	Serum	+	Endothelial	Archiv f Klin Chir B 38, 1889, p 61.	
38	Zangenbeck	25 yr	M	+	Excision	c	+	Serum	+	Endothelial	Archiv f Klin Chir B 38, 1889, p 61.	
39	Koenig	25 yr	F	+	Excision	c	+	Serum	+	Endothelial	Archiv f Klin Chir B 38, 1889, p 61.	
40	Nasse	19 yr	F	+	Excision	c	+	Serum	+	Endothelial	Archiv f Klin Chir B 38, 1889, p 61.	
41	Nasse	2 yr	M	+	Excision	c	+	Serum	+	Endothelial	Archiv f Klin Chir B 38, 1889, p 61.	
42	Nasse	11 yr	M	+	Excision	c	+	Serum	+	Endothelial	Archiv f Klin Chir B 38, 1889, p 61.	
43	Nasse	5 mo	F	+	Excision	d	+	Bloody serum	+	Endothelial	Phil Med Jr 1901, 8, p 533	
44	Kennard	22 mo	F	+	Excision	c	+	Bloody serum	+	Endothelial	J A M A 1920, 1, 32, p 233	
45	Hastead and Herzog	Adult	F	+				Bloody serum	+	Endothelial	Spontane Chir. Ding 1913, p 169	
46	De Quervain	Sch	M	+	Excision	c	+	Bloody serum	+	Wurzburger Abhandl 1913, p 169		
47	Capless	2 yr	F	+	Excision	d	+	Serum	+	Wurzburger Abhandl 1913, p 169		
48	Capless	5 yr	F	+	Excision	d	+	Serum	+	Wurzburger Abhandl 1913, p 169		
49	Carless	3 d	M	+	Partial excision	d	+	Serum	+	Wurzburger Abhandl 1913, p 169		
50	Robinson	3 mos	M	+				Serum	+	Wurzburger Abhandl 1913, p 169		
51	Koester	N B		+	Puncture	d	+	Serum	+	Wurzburger Abhandl 1913, p 169		
52	Wölffer	3 yr	F	+	Incision	c	+	Serum	+	Wurzburger Abhandl 1913, p 169		
53	Paetzold (Garete)	5 wk	F	+	Partial excision	d	+	Bloody serum	+	Wurzburger Abhandl 1913, p 169		
54	Paetzold	8 mo	F	+	Excision	c	+	Bloody serum	+	Wurzburger Abhandl 1913, p 169		
55	Paetzold	13 mo	M	+	Excision	c	+	Bloody serum	+	Wurzburger Abhandl 1913, p 169		
56	Paetzold	3 yr	M	+	Excision	c	+	Bloody serum	+	Wurzburger Abhandl 1913, p 169		
57	Paetzold	2 yr	F	+	Excision	c	+	Bloody serum	+	Wurzburger Abhandl 1913, p 169		
58	Paetzold	37 yr	F	+	Excision	c	+	Bloody serum	+	Wurzburger Abhandl 1913, p 169		
59	Trendelenburg	2 yr	M	+	Injection-iodine	d	+	Brown serum	+	Wurzburger Abhandl 1913, p 169		
60	Trendelenburg	9 d	M	+	Injection-iodine	c	+	Brown serum	+	Wurzburger Abhandl 1913, p 169		
61	Trendelenburg	1 d	M	+	Injection-iodine	c	+	Brown serum	+	Wurzburger Abhandl 1913, p 169		
62	Winwarter	14 m	M	+	Injection-iodine	c	+	Bloody serum	+	Wurzburger Abhandl 1913, p 169		
63	Schwann	N B	P	+	Puncture of ranula	d	+	Bloody serum	+	Wurzburger Abhandl 1913, p 169		
64	Burrow	14 m		+	Partial excision	d	+	Serum	+	Wurzburger Abhandl 1913, p 169		
65	Burkett	20	M	+	Drainage	c	+	Serum	+	Wurzburger Abhandl 1913, p 169		
66	Albert	Adult	M	+	Puncture reoperated	U mm	+	Clear serum	+	Med Times and Gazette 1868 II, p 79		
67	Roberts	3 yrs	M	+	Puncture reoperated	L	+	Serum	+	Lehr und Spec Chir 1891 Bd 1, p 216		
68			M	+	Puncture reoperated	d	+	Serum	+	Phil Med Times 1875 Mar 13, p 372		

## HYGROMA CYSTICUM COLLI

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69	Böhnet				Injection	c	Serum	
70	Robert				Puncture	d	Serum	
71	Broca	N B	Fœtus	O	Punc and Excis	d	Bloody serum	
72	Guillaumet				R L	Excision	+	
73	Hardie	5 m	F		M	Seton	Serum	
74	Hogg	14 m			F	Excision	Serum	
75	Holmes	8 yrs			F	Partial excision	Serum	
76	Hewitt	6 m			F	O	Serum	
77	Smith	3 wk			M	Imp	Serum	
78	Smith	8 m			R	Seton	Serum	
79	Smith	3 yrs			R	Seton	Serum	
80	Smith	Infant			F	Seton	Serum	
81	Dittl	6 mo			F		Serum	
82	Valenla	2 yrs			M.	Excised	Serum	
83	Devatz	N B	M	O	R	d	Bloody serum	
84	Kunemüller	6 m			R	L	Punctured	
85	Hofmohr	8 mo			R	Cautery	+	
86	Parrot	16 yrs			R	Excised	Serum	
87	Lannélangue	2 m	F		F	O	Serum	
88	Kocher	2 yr			F	Puncture	Serum	
89	Stolz	3 m			F	Injection-iodine	Serum	
90	Lücke	5 d	M	O	R	Puncture	Serum	
91	Lücke	few wk			R	O	Serum	

## HYGROMA CYSTICUM AXILLARE

No.	Author	Age	Sex	R	L	Operation	Result	Autopsy	Contents	Cyst Wall	Reference
1	Sandfort Hawkins Toft	5	F	R	L	Punctures	c		Serum	Multilocular	Obs. Ann. Path. v. 1, p. 21 London Med. Chir. Tr. v. 22, p. 236
2	James	5 mo	M	R	L	Puncture	c		Serum	Multilocular	Lancet 1801, v. 1, p. 1372
3	Senn	8 yr	F	R	L	Excision	c		Serum	Multilocular	Internat. Clin. 1803, v. 13, p. 129
4	Nasse	2 yr	F	R	L	Excision	c		Serum	Multilocular	Archiv f. Klin. Chir. 38, 1889, p. 614
5	Nasse	3 yr	F	R	L	Excision	c		Serum	Multilocular	Archiv f. Klin. Chir. 38, 1889, p. 614
6	Koenig	1 yr	M	R	L	Excision	c		Bloody serum	Multilocular	Archiv f. Klin. Chir. 38, 1889, p. 614
7	Carless	6 yr	M	R	L	Excision	c		Blood and serum	Multilocular	Archiv f. Klin. Chir. 38, 1889, p. 614
8	Robert	10 yr	M	R	L	Excision	c		Serum	Multilocular	Med. Pres. & C. 1904, v. 1, p. 150
9	Rumbold	4 d	M	R	L	Puncture and excision	c		Serum	Multilocular	Virchow Archiv Bd. 151, p. 392
10	Wenher	10 yr	M	R	L	Partial excision	d		Serum	Multilocular	Wein. klin. Wchn. 1894, v. 7, p. 531
11	Verneuil	9 m	M	R	L	Excision	d		Serum	Multilocular	Angeborener Cysten H. Hygrom, 1845, p. 488
12	Heschl			M	R	Drainage	c		Serum	Multilocular	Über ein angeborener Cysten hygrom der Achselhöhle, 1876
13				M	R	Puncture	c		Serum	Multilocular	Wein. klin. Wchn. 1891, No. 7, p. 533
14				M	R	Excision	c		Serum	Multilocular	Wein. klin. Wchn. 1891, No. 7, p. 552
15				M	R	Excision	c		Serum	Multilocular	Brunn. Beiträge, 18, 1897, p. 379
16	Rumbold	9 m	M	R	R	Excision	c		Serum	Multilocular	Brunn. Beiträge, 18, 1897, p. 379
17	Rumbold	2 yr	M	R	R	Excision	c		Serum	Multilocular	Brunn. Beiträge, 18, 1897, p. 379
18	Gjorgjevic	2 m	F	R	R	Excision	c		Serum	Multilocular	Brunn. Beiträge, 18, 1897, p. 379
19	Brazis	7 w	F	R	R	Excision	c		Serum	Multilocular	Brunn. Beiträge, 18, 1897, p. 379
20	Brazis	2½ yr	M	R	R	Puncture electrolysis excision	c		Serum	Multilocular	Brunn. Beiträge, 18, 1897, p. 379
21	Brazis	15 yr	P	R	R	O	d		Serum	Multilocular	Brunn. Beiträge, 18, 1897, p. 379
22	Brazis	1 m	M	R	R	Excision	c		Serum	Multilocular	Jahrb. Kinderheil. n. F. Bd. 16, 1881, p. 120
23	Anders	2 yr	M	R	R	Excision	c		Serum	Multilocular	Med. Times & Gazette, 1868, v. 2, p. 79
24	Birkett	28	M	R	R	Excision	c		Serum	Multilocular	Archiv f. Klin. Chir. xx, 1877, p. 673
25	Wegner	9 m	M	R	R	Excision	d		Serum	Multilocular	Archiv f. Klin. Chir. xx, 1877, p. 689
26	Wegner	2½ yr	F	R	R	Excision	d		Serum	Multilocular	Brunn. Beiträge Bd. 1, 1883, p. 500
27	Muller	1 yr	M	R	R	Excision	d		Serum	Multilocular	Deutsche Chir. 1888, L. 42, p. 251
28	Riedinger	35 yr	M	R	R	Injection Znclz.	c		Serum	Multilocular	Centralblatt f. Chir. 1880, p. 177
29	Panner	4 yr	M	R	R	Excision	c		Serum	Multilocular	Bull. et Mem. d. Soc. de Chir. de Paris, 1878, p. 815
30	Pilate	2½ yr	M	R	R	Excision	c		Serum	Multilocular	Med. Times & Gazette 1868, II, p. 79
31	Birkett	7 mos	M	R	R	Excision	c		Serum	Multilocular	Lehrb. d. Spec. Chir. 1889, II, p. 40
32	Koenig		Few mos	M	R	Post	Seton		Serum	Multilocular	St. Barthol. Rep. v. 2, 1866, p. 32
33	Smith	14 w	M	R	M	Post	Seton		Serum	Multilocular	St. Barthol. Rep. v. 2, 1866, p. 32
34	Dubar	2 yr	F	M	M	Excision	c		Serum	Multilocular	Bull. d. Soc. Am. de Paris 1892, p. 286
35		4 m	M	M	M		c		Bloody serum	Multilocular	

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## HYGROMA CYSTICUM (GENERAL)

Number	Author	Age	Sex	R L	Operation	Result	Autopsy	Contents	Multi-locular	Cyst Wall	Reference	
1	Paetzold	4 d	F	+	Thigh and leg	Excision	c	Lymph	+		Brun's Beiträge, 1906, No 51, p 654	
2	Hildebrand	1 m	F		Rectal sacral	Excision	d	+ Lymph	+	Endothel'm	Archiv f Klin Chir B, 49, 1894, p 204	
3	Hildebrand	3 yr	M		Rectal sacral	Excision		Lymph	+	Endothel'm	Archiv f Klin Chir, B 49, 1894, p 204	
4	Reichel	1 m	M		Left perineum	Puncture incision	d	+ Lymph	+	Endothel'm	Virchow Archiv 46, 1869, p 497	
5	Müller	2 m	F		Lips, tongue, cheek	Excision	c	Lymph	+	Endothel'm	Brun's Beiträge, 1883, Bd 1, p 498	
6	Vernueil	7 yr			Perineum	Excision		Lymph	+	Cruveilhier Anat Path Gen T, iii, 1856, p 498		
7	M Deguise	18 yr	M		Abdominal wall	Excision		Lymph	+	Bull d 1 Soc d Chir d Paris, 1857, T, 8, p 459		
8	Morel-Lavalie		R		Shoulder	O		+ Lymph	+	Bull d 1 Soc d Chir d Paris, T, 10, 1859, p 230		
9	Smith	18 m	F	R & L	Back of neck	O		Imp	+	St Barthol Rep, v 2, 1866		
10	Smith	3 m	F		Dorsal spine	O		Imp	+	St Barthol Rep v 2, 1866		
11	Delbet	3 m	R,		Orbital	Excision		Lymph	+	Bull d 1 Soc Anat de Paris, 1893, p 637		

heading of lymphangioma and it is difficult to sift out the cases which are really hygromas Winglowski's<sup>4</sup> recent article should be referred to, he studied various neck anomalies and dissected 150 half necks in children and adolescents and found rests 23 times

It would be very gratifying to explain the remarkable power of growth which these cysts have Unfortunately we cannot do this with absolute accuracy any more than we can tell why some people grow to be large and others remain small There are, however, many other instances of somewhat similar growth Ovarian cysts, parovarian cysts, dermoid cysts, both abdominal and subcutaneous, hypernephromas, mesenteric cysts, thyroglossal and branchial cysts, lipomata, exostoses, growths of the carotid body, common warts are all examples of individual power of growth which comes in tissues otherwise benign In view of these examples it is not strange that sequestrations of lymphatic tissue in the neck should occasionally show this great power of growth

SUMMARY—1. Cystic hygromas of the neck have been described for many years and their existence is undoubtedly

2 The term should be restricted to cysts lined with endothelium and having a marked power of growth

3 Such cystic growths are uncommon A careful search of the literature has so far revealed records of only 91 cases located distinctly in the neck and 35 cases located principally in the axilla, but in part at least extending there from the neck

4. The writer records three cases of undoubtedly hygroma and a fourth case which is believed to have been a hygroma but in which inflammation had destroyed the finer structure of the cyst walls

5 The most satisfactory explanation of the existence of these hygromas is that embryonic sequestrations of lymphatic tissue existed and that they had the power of persistent irregular growth

6 Excision is the best treatment If this is impracticable partial excision is the next best

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\* Archiv f Klin Chir, 1912, vol 98, p 151

# **EXCLUSION OF THE BLADDER, AN OPERATION OF NECESSITY AND EXPEDIENCY.\***

**BY CHARLES H. MAYO, M.D.,  
OF ROCHESTER, MINN**

EXCLUSION of the bladder is an operation which has been slowly accepted by the medical profession, and while it is generally admitted that such an operation may be necessary and often is advisable, the mortality following the earlier procedures was at least detrimental to enthusiasm. However, there has been much more to overcome than mortality in the matter of sentiment and the so-called conservatism which urged the preservation of the bladder at any cost regardless of control or comfort.

The natural mortality in these cases, although high in deformities and assured in malignancy, was, at least, not the work of man. Oppel,<sup>1</sup> quoting Mirotworzeff,<sup>2</sup> gives the statistics as follows: "Seventy patients between 10 and 20 years, 10 deaths; between 20 and 40 years, 17 deaths; between 40 and 50 years, 5 deaths; one reached the age of 70 years." He states further that the natural mortality in cases of exstrophy of the bladder in children show that more than half die before the tenth year.

Within a comparatively recent period our interest in the subject has been revived by reports of many successful cases of exclusion of the bladder and with the improved technic of the various procedures. To determine the best method of disposal of the secretion of the kidneys in individuals in whom it is necessary or expedient to exclude the bladder, is still one of the serious problems of surgery. To say, however, that the modern operation exposes the patient to greater danger from infection than is compensatory with the mitigation of his suffering, together with the natural mortality of the disease, is not consistent with the history of the patients or the records of the progress of surgery in these

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\* Read before the American Surgical Association, May 8, 1913.

cases. Unfortunately, many of the patients under discussion are already suffering from the secondary infective complications before operative measures are advised. The patients under discussion may be grouped under three headings (Fig. 1)

(1) Those suffering from congenital anomalies of the bladder or urethra of such character as not to permit restoration with controllable urine or who cannot be relieved from painful sequelæ by local surgical or other measures

(2) Those in whom portions of the ureter are necessarily or accidentally injured or removed during abdominal, pelvic or sacral operations

(3) Those in whom malignant disease of the urinary bladder is too extensive to permit removal by partial resection of the bladder with retentive function under control, and those in whom gross malignant or other disease of the bladder exists, but in whom the power of retention and control add to their suffering. These cases will necessarily be limited in number.

For the repair of the first group various surgeons have devised a wonderful variety of ingenious methods. Making a bladder from skin flaps was originated by Roux<sup>3</sup> in 1852. Various modifications have been developed by Thiersch,<sup>4</sup> Nelaton,<sup>5</sup> Wood<sup>6</sup> and many others. The compression of the bony pelvis (the anterior portion of which is usually missing) was instituted by Passavant,<sup>7</sup> the breaking and subcutaneous section of lateral bony arches were devised by Koch,<sup>8</sup> König<sup>9</sup> and others, and Trendelenburg<sup>10</sup> successfully accomplished the closure of the bladder, covering it with an anterior bony arch by freeing the sacro-iliac joints. Epispadias, especially in the female, which is so extensive as to cause a loss of urinary control, is also placed in this group, although a few of these cases may be benefited by local measures.

Excellent results have been claimed for the Goebel<sup>11</sup> method of providing a voluntary sphincter made from the pyramidal muscles. Ssubbotin's<sup>12</sup> method, in its effort to develop a bladder with control of the sphincter, is probably the most ingenious. It is especially applicable in males. An anterior incision is made within the anus, the space in front

FIG 1

FRV



Exstrophy of bladder in male Exposed mucosa with ureteral openings



of the rectum and within the sphincters is tunnelled up to reach the base of the bladder, a rectangular strip, of which the future urethra is made, is drawn down to protrude from the anal ring in the fore part of the rectal opening. The remainder of the bladder and the anterior part of the rectum is converted into a closed pouch, the control of which is contained in the rectal sphincter. The operative mortality in these cases is 25 per cent and should the technic fail the patient is exposed to the loss of control of both bladder and bowel, since no other operation is then possible. The new bladder is exposed to infection by all the intestinal flora through its short urethra. The plan of Gersuny<sup>13</sup> involved the same principle of utilizing the anal sphincter to control the open end of a separated loop of bowel to which the ureters were attached.

The objection to any method of operating for the repair of these defects which does not control urine automatically is a very serious one. Uncontrollability of the urine is only accepted by the patient who acquires the condition as the lesser of two evils—a greater one being the pain due to its retention or delivery. If an uncontrolled bladder be made from an exstrophy the patient is no better off, and, if anything, worse than a high epispadias, since the more perfectly an uncontrolled bladder is developed the more surely will it become infected or filled with stone or phosphatic concretions from the decomposing urine. He thus becomes more liable than before to an ascending infection and develops conditions which require the reopening of the bladder.

The cloacal condition, which exists normally in fowls and is also the condition which exists during the first weeks of the human embryo, early suggested the thought of making such a deflection of urine through the rectum. Such a method secured a retentive space under control, and was comparatively easy of accomplishment.

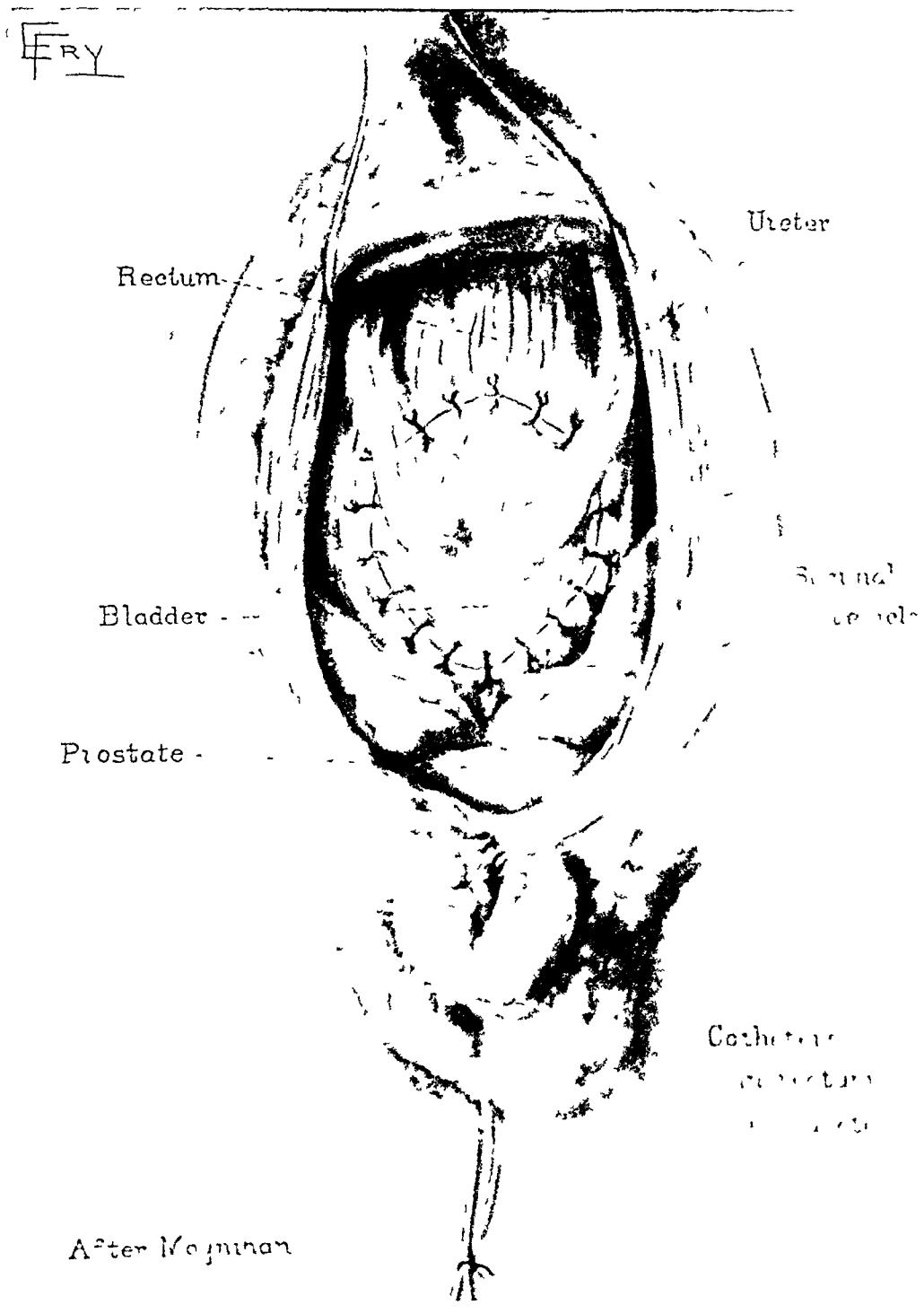
The high mortality from ascending infection of the kidneys through the ureters following the old methods of intestinal union made the procedure almost prohibitive, especially when complications were increased by shock and peritonitis.

Some of these patients were already debilitated by the infection of one and sometimes both kidneys or their pelves. Woolsey<sup>14</sup> reported stones in both ureters in a case of exstrophy of the bladder and a patient with epispadias, having stones in the kidney, was observed in our clinic.

In order to obviate these risks in cases of exstrophy, Maydl<sup>15</sup> (1892) removed the base of the bladder with the ureters attached and transplanted the segment into the rectum as a transperitoneal operation, the ureteral openings being considered as the valves. Other surgeons have projected the area of bladder into the rectum extraperitoneally, the wall of which was closed around the ureters or it was transposed and sutured into the incised rectal wall of which it became a part. Since the majority of the patients in this group are males, they lend themselves readily to such treatment. Russian surgeons, using Maydl's method, report 32 per cent mortality. Orlow<sup>16</sup> reports 17 cent mortality in 61 cases and Drucbert's<sup>17</sup> analysis of 81 cases gave 27 per cent of deaths within 15 days of the operation.

More recently Moynihan<sup>18</sup> has converted much larger areas of the bladder into the wall of the rectum, thus increasing its capacity (Fig. 2). This operation was varied by Lendon,<sup>19</sup> Peters,<sup>20</sup> Sherman,<sup>21</sup> and others by removing the ureters from the wall of the bladder including a small area of attached mucosa which is projected into the bowel. These operations were usually performed extraperitoneally, though Jaja<sup>22</sup> converted the method into an intraperitoneal one. In reporting several cases done by the Lendon-Peters method, Buchanan<sup>23</sup> credits Bergenhem<sup>24</sup> of Nykoeings with having antedated them by five years (1894). The posterior operation has been performed by Knaggs<sup>25</sup> through the Kraske<sup>26</sup> sacral resection. Various methods of uniting the base of the bladder or ureter with the anterior rectal wall have been devised, for example, the Boari<sup>27</sup> spring button to develop a permanent vesicorectal fistula within a small closed bladder or a ureteral-rectal one by suture, or by the necrosing due to the pressure of forceps. Some surgeons have aimed at half a loaf, by extirpating the bladder after having united the ureters

FIG. 2





with the vagina as did Pawlik,<sup>28</sup> Sommers,<sup>29</sup> Chavasse,<sup>30</sup> and others, or with the inner end of the urethra, as done by Sonnenburg<sup>31</sup> Interesting and ingenious methods have been advocated by Rutkowsk<sup>i</sup><sup>32</sup> and other observers, for example, developing bladders from portions of intestine which are separated from the fecal flow by double section and closure with anastomosis of proximal and distal ends of intestine The new bladder is supplied by its attached mesentery, and the ureters are anastomosed with it Connell<sup>33</sup> showed experimentally that unilateral attachment of the ureter was simple, but fatal if the second ureter was also united

In case the cæcum is thus employed, as in a case reported by Makkas<sup>34</sup> (1910), an appendicostomy is made through which the urine is drawn by a catheter passed at regular intervals of a few hours Surgeons have endeavored to develop a form of cloaca by section of the sigmoid several inches above the rectum, closing the distal end and anastomosing the proximal end to the bowel just above the rectum The ureters are then attached to the blind extremity, thus aiming to avoid direct fecal contamination While the urinary flow may wash out the regurgitant faeces, the natural tendency of attached sections of the bowel, out of circuit, is to impact and in that event the desired result would not be obtained

In the second group of cases are those in which something must be done with the injured ureter when it cannot be re-united to itself or reattached to the bladder, as will occur in the occasional case The injured ureter may be reunited with the other ureter if that is patent, or one or both ureters may be united to the colon Mirotworzeff and Tichow<sup>35</sup> believe that it is best to unite the ureters to the pelvic colon and that evacuations should be fairly frequent to avoid absorption Berg<sup>36</sup> demonstrated that when the urine traversed the entire length of the large bowel urinary intoxication occurred, which would indicate that the methods used to unite an injured ureter to the end of the appendix are more ingenious than practical, offering no advantages over older methods which have failed This is also true of the technic used in

Fink's<sup>37</sup> fatal case in which the base of the bladder exstrophy was united to the appendix

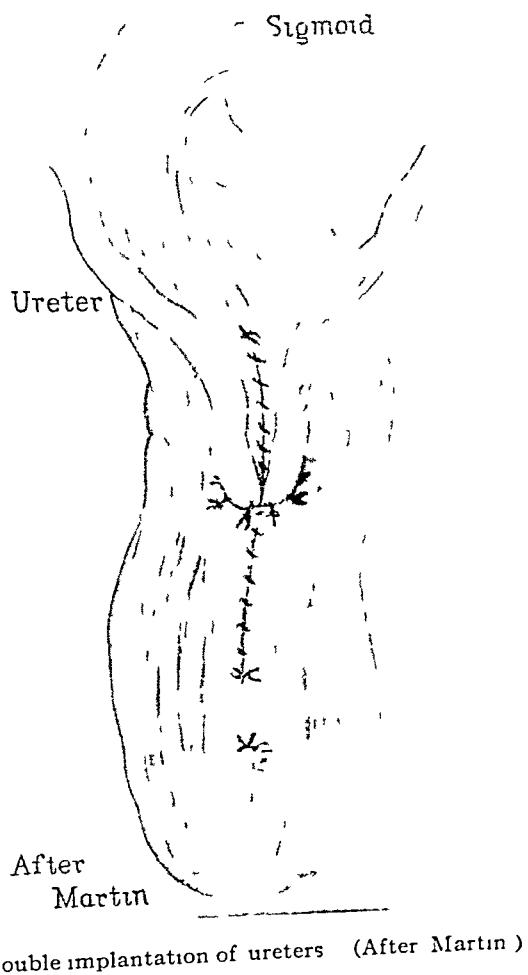
Under some circumstances, the remaining kidney being healthy, one ureter may be tied, causing the death of the kidney. Many observers believe that by whatever method the ureters are attached to the bowel they will frequently transmit infection to the kidney or its pelvis. In this connection Oppel's report is interesting, showing that some pyelitis is common following ureteral anastomosis and that autopsies made years afterward show that the conditions may clear up without a trace of their effects on the kidney.

Direct drainage of the urine to the skin was advised by Ballance and Edwards<sup>38</sup> in 1886. This has also been accomplished by pelviotomy and by Watson's<sup>39</sup> nephrostomy. In 1896 Harrison<sup>40</sup> performed the operation and deflected the ureter to the skin of the loin after tying the other ureter. The method was later repeated on both ureters by Bottomley<sup>41</sup> and also by Rovsing<sup>42</sup> without their knowing of Harrison's work. These operations were done both transperitoneally and extraperitoneally, the urine being collected by special apparatus. The operation is a simple one and can be done in two stages, that is, one kidney or one ureter at a time, the bladder being dealt with or not, according to the condition present. Bovee<sup>43</sup> has collected 13 cases of cutaneous ureterostomy.

The patients in the third group, namely, those having malignant disease of the urinary bladder, form an interesting and complicated series. Transplanting one ureter into the bladder is no longer a rare operation. Such procedures are satisfactory for the suitable case, in which a controllable bladder will be retained, but other methods are necessary for those patients in whom all of the bladder must be removed or in whom life can be prolonged and comfort secured even though the condition be too far advanced locally or by metastasis to warrant radical procedures.

Tichow and Grammatikati<sup>44</sup> report 61 cases of neglected cancer of the uterus in which the vagina, bladder, uterus and

FIG 3





lymphatic glands were removed and the ureters implanted into the rectum. The mortality was 30 per cent.

The history of the various attempts to transplant the ureters to the bowel is a long one. From a perusal of the voluminous literature on the subject it would appear that the best theoretical and practical operations, when they can be employed, are those which permit the ureters to traverse some distance between the mucosa and outer wall of the bowel before penetrating its lumen or are infolded by the wall of the bowel for a space, and next those methods in which the base of the bladder is transposed and made a part of the rectal wall.

Ureterostomy and nephrostomy to the back is a procedure which may be recommended for special conditions, such as a diseased colon, advanced cancer of the bladder, or of double tuberculosis of the kidney and bladder.

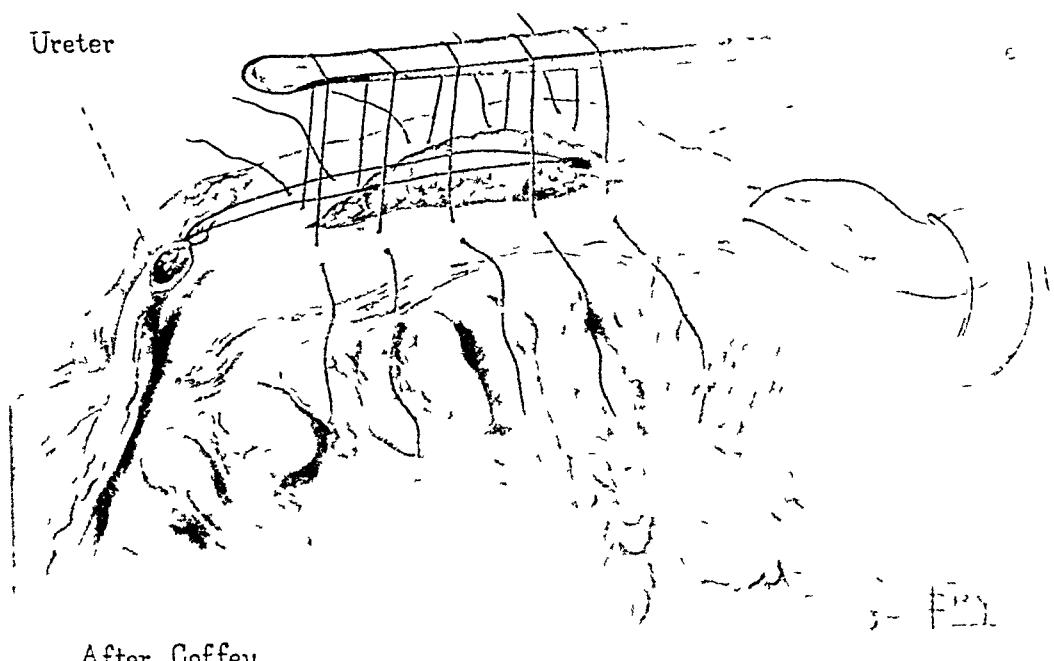
In the year 1790 Petit<sup>45</sup> called attention to the valve-like openings of the ureters, and it is nearly a half a century since ureteral-rectal and vesicorectal anastomoses were made by Simon,<sup>46</sup> followed later by Lloyd<sup>47</sup> and Johnson.<sup>48</sup> The variety of the valve type of operation was also reported by Fowler<sup>49</sup> (1898), Martin,<sup>50</sup> Carl Beck<sup>51</sup> (1899), and later by Frank.<sup>52</sup> Coffey<sup>53</sup> has made an extensive investigation concerning the valve function of the duct openings of both the common duct of the liver and of the pancreas. He has proved experimentally and mechanically that the valve effect is caused by the extension of the duct for some distance between the mucosa and the muscularis (Fig. 3).

Cabot<sup>54</sup> has shown that the ureter is similarly placed in the wall of the bladder for a distance of one to one and one-half centimetres. Direct transplantation of the ureters failed in not providing for compression of the ducts by internal pressure, thus permitting dilatation of the ureters and regurgitation into them. The method of transplanting the base or a great portion of the bladder into the wall of the rectum is practical as it then becomes subject to the same internal tension as the rest of the intestine. This method is not difficult of accomplishment in the male.

Those operations in which the ureters are transplanted and have been preserved to their tips are correct only in principle if they are made after one of the methods which secures compression of the lumen.

The Coffey operation, practically a divided Martin, is accomplished by separating the ureters that have been isolated and brought through the posterior peritoneum, the distal ends being ligated and buried. A double needled ligature is attached to the split ends of each ureter. At a point as low as convenient the sigmoid is held in a curved rubber-covered clamp to protect against the discharge of intestinal contents. The bowel is then incised longitudinally for one and one-quarter inches through the peritoneum and muscularis, but not the mucosa, the mucosa is perforated at the lower end of the incision. The two needles are passed into the lumen of the bowel through the opening and out of its wall, slightly separated, one-half inch lower down, and are used to draw the ureter through the opening into the lumen, where it is held by tying the two threads. The cut muscularis and peritoneum is now closed over the ureter in the incision by two rows of sutures (Fig. 4). The second ureter may now be attached or preferably the operation delayed for a later period. The Stiles operation (1907) and that of Mirotworzeff, which method is nearly the same and was reported in 1910, secure much the same effect by infolding the bowel over the ureter by numerous sutures, like a Witzel gastrostomy. The deflection of the ureters into the back, as described by Bottomley, is accomplished by a lateral incision, similar to that made in the extraperitoneal operation for stone in the ureter. The ureter is divided, the lower end ligated and the proximal end brought out of the small incision posteriorly and an inch or more above the crest of the ilium, where it is sutured to the skin. This operation has been performed in our clinic from within the abdomen. If indicated at all, we consider this method more applicable for double tuberculous disease or advanced malignancy than to anastomose the ureters with the intestine. Should there be a tendency to close, these openings can be maintained by the use of meatus dilators. Satisfactory urine

FIG 4



After Coffey

Method of incorporating ureter into large bowel by the division of the peritonium and the muscularis (After Coffey)

FIG 5



Included ureter in large bowel



collectors are easily adjusted by means of a belt (Fig 5).

Concerning the dangers of necrosis of the ureters The work of Margarucci<sup>55</sup> Monari,<sup>56</sup> and also that of Kobylnski<sup>57</sup> show that they may be freely separated for several inches without danger of necrosis if left free from tension

In 1878 Smith<sup>58</sup> transplanted the ureters into the colon in a case of exstrophy He noted the intermittent peristaltic delivery of urine from the ureters, and Kelly<sup>59</sup> has observed that when handled or irritated the peristalsis is stimulated This point is of value in searching for the ureter within the abdomen Scratching across the peritoneum over the supposed ureter proves it to be such if the peristaltic wave is seen, since the pelvic portion of the ureter is intimately attached to the posterior peritoneum, which should be remembered in locating them in low extraperitoneal operations

In our cases of ureteral colonic implantation we have followed Stiles's plan of doing the operation in two stages with an interval of from one to three weeks between It has been our experience that these operations are not satisfactory in children who are too young to attend to their own bowel movements The control will be more difficult to secure primarily in these cases, and for a time they will require more frequent attention than before the operation

Oppel's suggestion to try milk diet after Metchnikoff's<sup>60</sup> plan of reducing the intestinal bacterial flora is undoubtedly a good one in the preparation of these patients Oppel depends also on the functional test of the kidneys by giving a hypodermic of indigo carmine, which he considers satisfactory if the urine shows blue in 15 or 20 minutes Phenol-sulphonephthalein is used as a functional test of the kidney in cases examined in our clinic

It is hardly necessary to state that the colon should be free from disease when anastomosing the ureters with it Another point to be remembered in operations on the large bowel is that a laxative should be given two days preceding the operation in order that the contents may again become solid

In the second group, or cases of injured ureters, it is often possible to implant the ureter into the bladder by the

Coffey or Stiles<sup>61</sup> method, a procedure we accomplished in 8 cases of cancer of the bladder involving one ureteral area. The cancers were removed transperitoneally, transplanting the ureters to the opposite side of viscera while it was open. There were three cases of removal of the bladder for cancer. In one, a female, aged sixty-two, the ureters were transplanted into the rectum by the Stiles method. In spite of a defective kidney and dilated ureters there was a good operative recovery, but sudden death occurred some weeks later from cerebral hemorrhage. In one, a female aged twenty, the ureters were transplanted into the urethra by the Sonnenburg method. This patient made a primary recovery, and died one year later from acute infection of the kidneys. In the third case, a male, aged fifty, the bladder was removed transperitoneally, bringing the ureters into the back. This patient continues in good health, doing farm work for more than three years. In four cases of exstrophy of the bladder in which the organ was removed the ureters were transplanted into the rectum and lower sigmoid by the Coffey method without mortality. Except in children, a day control of from 3 to 5 hours and an all-night retention may be obtained by this method.

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# ANNALS OF SURGERY

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No 2

## ORIGINAL MEMOIRS.

### THE SURGERY OF THE PANCREAS.\*

I INJURIES TO THE PANCREAS IN THE COURSE OF OPERATIONS ON THE STOMACH

II INJURIES TO THE PANCREAS IN THE COURSE OF OPERATIONS ON THE SPLEEN

III RESECTION OF HALF THE PANCREAS FOR TUMOR

BY WILLIAM J. MAYO, M.D.,  
OF ROCHESTER, MINNESOTA

THE deep situation of the pancreas renders it difficult to obtain correct knowledge of its diseases during life. The little knowledge which is obtained is due chiefly to the individual experience of various surgeons and to experimental investigations.

The pancreas is derived from two or three buds from the foregut and early in fetal life is an intraperitoneal organ. When rotation takes place the pancreas is turned on its right side, losing its posterior peritoneum, which becomes converted into fibrous tissue. Possibly the diffuse character of fat necrosis both within and without the peritoneal cavity from pancreatic perforation can be accounted for in this way.

The pancreas receives its blood supply from five or six different sources, the most important of which are the superior pancreaticoduodenal, the inferior pancreaticoduodenal, the inferior pancreatic and the branches that are derived from the splenic artery as it runs behind the superior border of the body of the pancreas. The lymphatics of the pancreas

\* Read before the American Surgical Association, May 8, 1913

are not collected in one group but follow the vascular supply—an important fact in connection with the causation of pancreatitis, as pointed out by Deaver<sup>1</sup>

The pancreas has no true capsule but, when irritated, one quickly forms from the peritoneum and those tissues derived from the peritoneum (Fig 1)

The pancreas is hidden by the liver, duodenum, transverse colon and especially by the stomach. The two latter organs vary in position to a considerable extent. Access to the pancreas for operative purposes is usually best obtained through the gastrocolic omenta, drawing the stomach upward and the transverse colon downward. The pancreas, especially the head, is usually fixed in position, but it may be more or less movable in the body and tail. During routine abdominal operations patients are occasionally seen in whom the pancreatic attachments are so loose that the pancreas as a whole can be drawn outside the abdominal cavity

#### I INJURIES TO THE PANCREAS IN THE COURSE OF OPERATIONS ON THE STOMACH

Haberkant<sup>2</sup> reported a mortality of 76 per cent in his cases of resection of the stomach for cancer in which there were pancreatic attachments resulting in injuries to the pancreas. Mikulicz<sup>3</sup> found a mortality of 70 per cent in his cases when the pancreas was injured as against 27.5 per cent when it was not injured. In 448 resections of the stomach for benign and malignant diseases up to Dec 31, 1912 (W J and C H Mayo) the average mortality was 10 per cent. In about 8 per cent of these cases the pancreas was injured and the average mortality was 11 per cent.

In none of these operations, however, was the main pancreatic duct reached, usually only a superficial piece was removed from the surface at a point where the pancreas was adherent to the diseased stomach. The bleeding was usually free and best controlled by catgut on a curved needle. It was noted that in these cases the pancreas had a fibrous capsule, the result of the localized peritonitis.

FIG 1



Showing anatomy of pancreas and its anatomic relations

FIG. 2



Showing excavation in pancreas following resection of pyloric end of stomach with pancreatic involvement. The end of stomach and end of duodenum both closed.





After removing the pyloric end of the stomach for cancer we close the end of the duodenum with two superimposed purse-string sutures and then apply the closed duodenal stump directly to the wound in the pancreas, as suggested by Willy Meyer<sup>4</sup>. The anterior peritoneum and adventitious sheath of the pancreas is then sutured to the anterior surface of the duodenum. We have used this method for something like six years and have not had leakage in a single instance either from the duodenum or the pancreas.

Fig 2 shows the end of the duodenum closed by purse-string sutures and the vessels tied in the excavation in the pancreas. Fig 3 shows the end of the duodenum fastened in the wound in the pancreas.

Ulcers of the posterior wall of the stomach often perforate and become attached to the pancreas. In a previous paper I described a method of transgastric excision of such ulcers<sup>5</sup>. These ulcers usually form an excavation into the body of the pancreas and it is necessary to excise them cleanly well down into the pancreatic tissue, leaving no area of infection. This opening cannot be closed by sutures and after stopping the hemorrhage with catgut on a needle, a piece of the gastrohepatic or gastrocolic omentum is mobilized and turned into the excavation in the body of the pancreas, being held in place by catgut sutures. In our earlier cases we used a drain of folded rubber tissue but abandoned it as unnecessary since no drainage followed.

## II INJURIES TO THE PANCREAS IN THE COURSE OF OPERATIONS ON THE SPLEEN

In 31 splenectomies performed in our clinic the tail of the pancreas was injured three times, owing to the fact that the tail passes with the splenic vessels well up into the hilum of the spleen. In performing splenectomy the spleen is withdrawn from the abdomen, the adhesions to the diaphragm and region of the left kidney are separated and a rubber-covered clamp of the Lower variety is used to catch the entire pedicle. The tail of the pancreas is often so closely

incorporated with the pedicle of the spleen that it occasionally is injured. This occurred in three of our cases.

In one case about one and one-half inches of the tail of the pancreas was found attached to the removed spleen and the pancreatic duct was plainly visible in the ligated stump. After covering the stump with peritoneal tissue and attaching a drain (which was unnecessary since no drainage followed) it was allowed to drop back into position. The patient recovered.

In the second case the tail of the pancreas was found tied in the pedicle about an inch from the tip. Since the case was one of splenic anaemia and the patient in poor condition, the stump was allowed to drop back in this condition. The patient recovered. The third case (A77736) was a male, aged twenty-six years, in whom a diagnosis of splenic anaemia had been made. At operation (January 14, 1913), the spleen was found to be of great size, extending well to the right of the median line and down to the brim of the pelvis. On account of the adhesions it was unusually difficult to remove the spleen from the abdominal cavity. The clamp was applied and the organ cut away. Catgut ligatures were applied to the splenic pedicle in sections. As the ligatures were tightened on the splenic artery, which was large, tortuous and atheromatous, it cut through and, with a gush of blood, dropped down behind the pancreas. It was caught with the fingers and compressed against the body of the pancreas while a second ligature was applied. This cut through also and it was evident that the splenic vessels would not maintain direct ligature. A double catgut strand was therefore placed around the entire body of the pancreas about three inches from the tail including the splenic vessels, the pancreas being used to strengthen the walls of the vessels. The pancreatic tissues were considerably crushed as the ligature was pulled taut. The hemorrhage was controlled immediately but as softening of the pancreatic tissue with loosening of the ligature was feared, a second ligature was applied in the same manner but one inch further to the right. It is probable that complete separation of four inches of the pancreas from the head and remainder of the body occurred. The patient made a good recovery and left the hospital in two weeks.

Coffey<sup>6</sup> demonstrated experimentally that tying the pancreatic duct with or without the surrounding pancreatic tissue

would not permanently occlude the pancreatic duct, that the duct would regenerate and reunite within a few days. While the duct itself was not actually tied, the pressure of the ligatures about the pancreas must have been sufficient to mechanically obstruct its lumen. The abundant supply of blood from numerous sources prevented serious damage to the nutrition of the portion of pancreas cut off by the pressure of the ligature.

### III RESECTION OF HALF THE PANCREAS FOR TUMOR

CASE No A68699—J L, female, aged thirty-seven years. Date of operation, June 15, 1912. History of severe attacks of pain extending into the left abdomen, and left lumbar region so severe at times as to necessitate the use of morphin. At no time was the patient free from pain. Point of tenderness over the region of the body of the pancreas. Loss of weight, 17 pounds. Duration of illness, 3 months. Contents of stomach, stools, blood, and X-ray negative. Tentative diagnosis, cholelithiasis with pancreatic involvement. An exploratory incision was made two inches to the right of the median line in the upper rectus muscle. There were no gall-stones but a hard, irregular tumor the size of an egg was found in the body of the pancreas about its middle. A second working incision was made through the upper rectus muscle three inches to the left of the median line. The gastrocolic omentum was divided, the stomach drawn upward and the transverse colon downward. The body of the pancreas and the tumor were brought to the surface as well as possible. It seemed best to begin at the tail and remove the left half of the pancreas with the tumor. This proved to be a difficult procedure since the entire pancreas was deeply placed and fixed in position. One of the deep veins was injured and a free hemorrhage occurred which was difficult to control without injury to the splenic vessels. Finally the tail and body of the pancreas with the tumor, about  $4\frac{1}{2}$  inches in all, was separated, a strong clamp applied across the body one inch to the right of the tumor and the left half of the pancreas with the tumor cut away. Four clamps had previously been attached to vessels in the deep portions of the wound. An attempt was made to tie off one of these clamps with catgut on a needle, and a fresh point of bleeding which required another clamp was the

result. The handles of the five clamps and the handles of the clamp previously placed across the body of the pancreas were brought to the surface and the cavity from which the pancreas had been removed was packed loosely with gauze. On the fourth day the clamps were loosened and on the fifth day they were removed. The gauze was removed on the tenth day. The patient made a good recovery, regained her normal weight and remains well. The tumor, which had the external characteristics of a malignant growth, proved on section to be a benign thick-walled trabeculated cyst buried in sclerosed pancreatic tissue.

Resections of the pancreas for tumor have seldom been made, although as far back as 1884 Billroth<sup>7</sup> removed the pancreas for an adenocarcinoma with recovery of the patient. Finney<sup>8</sup> collected 16 cases from the literature in which the pancreas had been removed for tumor, and he reported a most interesting one of his own. There were 9 recoveries and 8 deaths in the series. All of the fatalities occurred in cases of resection for malignant disease. In Finney's case and in two others, a complete resection including the tumor was made and the divided ends of the pancreas resected with recovery of the patients.

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# PANCREATIC AND PERIPANCREATIC LYMPHANGITIS

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THE pathogenesis of the inflammations of the pancreas is a subject of not only academic interest, but of extreme importance in the therapy and prevention of these affections. Clinical observations and experimental work have made it sufficiently clear that the various phases of acute and chronic pancreatitis depend on no single factor or set of factors. The underlying causes may be summarized as circulatory disturbances, toxæmias, obstructions of the excretory duct or ducts, and bacterial infection. Any one or any combination of these agencies may result in more or less acute or chronic damage to the parenchyma of the pancreas with accompanying alterations of its stroma, vessels, and ducts.

From work already done it has been determined that infection and duct obstruction are the two most important causes of pancreatitis. In the majority of cases, moreover, pancreatitis is not a primary condition, but occurs secondarily to some other focus of disease within the abdomen. Cammidge (*Lancet*, June 3, 1911) states that in 414 cases of which he has notes the pancreatic condition was secondary to some morbid condition of the digestive tract in 211 (51 per cent). In 37 per cent it was associated with disease of the biliary apparatus, chiefly gall-stones. Robson has reported that he found the pancreas involved to a greater or less degree in 60 per cent of the cases of common duct cholelithiasis. Kehr,

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Mayo, Moynihan, and many other surgeons of wide experience in abdominal work, agree that this association is a frequent one, even though the figures given by different men as to the percentage of incidence vary rather widely in accordance with the personal equation in the interpretation of the findings at operation. Even post-mortem statistics may be cited to show the extent to which pancreatic lesions are dependent upon disease of the biliary tract. In McGlinn's study of 8515 post-mortem examinations made at the Philadelphia General Hospital, the pancreas was found diseased in 382 instances (0.4 per cent). When gall-stones were present (506 cases) the pancreas was diseased in 66 cases (1.2 per cent). These lesions were of the more marked variety, including tumors and the outspoken forms of pancreatitis. The lesser grades of pancreatitis, noted at operation, are not noted in this series.

Our own experience coincides with that of others in this respect and in addition we have been impressed by cases in which a similar relation appeared to exist in conjunction with diseases of the pylorus, the duodenum, and the appendix.

The following case is one of several that exemplify the association of pancreatitis with chronic duodenal ulcer.

CASE I.—J. W., aged sixty years, a farmer by occupation, was admitted to the German Hospital, April 23, 1913.

Chief complaint, dull pains in the epigastrium and nausea.

*Present Illness*.—Has been suffering from "dyspepsia" for past thirty years—pains in the epigastrium about the middle of the afternoon, relieved by the evening meal, pain again near midnight, again relieved by food. Has been troubled by belching and water brash. Baking soda relieved immediately. Has had periods of months when he was free from all symptoms. Ten years ago had an unusually severe attack lasting ten weeks, with nausea and vomiting, and severe epigastric pain three to four hours after eating. After this attack he felt better than ever before for the next four years. The past two months following an attack of "La Grippe" his condition has grown worse. He has vomited for the past week, at first several hours after eating, with relief of pain, and later immediately on taking food. The pain is referred to back. He vomited a little blood several times,

from straining, he thinks He has lost 20 pounds in the last year Feels strong

Family and social history, negative Had typhoid fever at ten years of age

*Physical Examination*—Anaemic looking old man Poor musculature Sclerotic arteries

Chest Negative

Abdomen Slight fulness in the epigastrium and lower abdomen One tender spot in the epigastrium about two inches above the umbilicus, in the midline No tender spot in back Left inguinal hernia

Blood pressure. Systolic, 164, diastolic, 110

*Laboratory Findings*—Blood count Hæmoglobin, 69, red blood corpuscles, 4,580,000, white blood corpuscles, 8700, polymorphonuclear neutrophiles, 65, lymphocytes, 25, large mononucleas, 10

Test breakfast. Quantity, 210 cc, 800 recovered, occult blood, strongly positive to benzidine, faintly positive to guaiac, free HCl, 57, total acidity, 85

Microscopy Much undigested and partially digested starch Much free fat Epithelium

Full meal (removed after 7 hours) Quantity, 75 cc, occult blood, positive to benzidine and guaiac, free HCl, negative, total acidity, 18, lactic acid, negative

Microscopy A little free fat, much undigested starch, epithelium

Stool Bile, faintly positive, occult blood strongly positive to benzidine, negative to guaiac

Microscopy Some free fat globules, vegetable fibres and granular debris

Fluoroscope with bismuth (80 grammes)

Stomach neither dilated nor puffed Lower border is high midway between umbilicus and ensiform Very poor peristalsis

*Operation* (April 28, 1913)—Upper right rectus incision The second portion of the duodenum is the site of a healed ulcer The head of the pancreas is enlarged and compresses the duodenum It shows the appearance of chronic inflammation and does not suggest malignancy The peripancreatic tissues are thickened and the regional lymph glands are enlarged The duodenum was plicated over the site of the ulcer and a posterior gastro-enterostomy performed

Fitz laid stress upon chronic duodenitis as a factor in the production of pancreatitis. Alcohol, which is of some importance as a predisposing factor, probably exerts its influence through the production of gastroduodenal catarrh.

Robson reported that among 46 cases of interstitial pancreatitis with gall-stones or other removable cause there were five where the pancreatitis was associated with duodenal ulcer.

We have previously pointed out that pancreatitis is more common in men than in women, the reverse of what is true in biliary disease. This fact casts doubt upon the origin of pancreatitis through the medium of infection from the biliary tract, but readily parallels the greater frequency of gastroduodenal catarrh in males. We have observed that the duodenal ulcer when it is situated at its usual point of predilection, just distal to the pyloric ring, is less apt to be complicated by pancreatic involvement than when the ulceration is in the second portion of the duodenum in closer relationship to the pancreas. We are not speaking now of the cases of chronic perforation of the duodenum by which the ulcer eventually comes to make its bed in the tissues of the pancreas, but of those cases of non-perforating ulcer in which the route of transference of the infection to the pancreas is not so obvious.

In what manner does the pancreas become involved secondarily to infection of other portions of the digestive tract? During the past year and a half we have been noting this condition of the pancreas and its surroundings particularly with this question in mind. We have observed a large number of cases of pancreatic involvement prior to this date, but as our interest in the particular variety of etiology with which this paper deals began about that time we have considered only the more recent cases. The relationship of the appendix to pancreatitis we have not had the opportunity to investigate, not feeling justified in making an upper abdominal exploration during the course of an appendectomy.

During this time the pancreas has been investigated in the following cases and found involved or uninvolved, as indicated in the following table:

	No of cases	Pancreatitis present	Pancreatitis absent
Cholelithiasis	99	40 (40.4 per cent)	59 (58.6 per cent)
Cholecystitis .	14	9 (64.2 per cent)	5 (35.7 per cent)
Duodenal ulcer	16	2 (12.5 per cent)	14 (87.5 per cent)
Gastric ulcer	3	1 (33.3 per cent)	2 (66.6 per cent)

These groups are not sufficiently large to base a fixed estimate of the percentage liability of pancreas implication in the diseases mentioned, but they do show a striking frequency of involvement.

The avenues by which infection may reach the pancreas are: (1) The blood stream; (2) through the ducts, and (3) by way of the lymphatics.

The systemic circulation is but little considered in connection with pancreatic disease. The diseased conditions with which pancreatitis is associated are not characterized by bacteræmia, nor is the pancreas often affected in other conditions in which bacteria are commonly present in the blood stream. That this mode of infection may occur is evidenced by the participation of the pancreas in miliary tuberculosis, in syphilis, and occasionally by abscess formation in pyæmia. Still the weight of clinical evidence is against this source of infection of the pancreas in any considerable proportion of cases.

The ducts of the pancreas are commonly regarded as the vulnerable point in the gland's defences. They empty upon a mucous surface which is subject to inflammations and over which pass great numbers of pathogenic bacteria. Ascending infection under these conditions is a ready and seemingly satisfactory explanation of pancreatic inflammation. Furthermore, the usual mode of termination of the duct of Wirsung in the ampulla of Vater affords opportunity for the bile to gain entrance into the pancreatic duct. Gall-stones often travel down the common duct inducing inflammation as they pass and at times diverting the bile into the pancreatic duct in the manner pointed out by Opie. The bile is irritant in itself to the pancreas, and in addition it is frequently infected. Clinical and experimental proof is not lacking that this does

occur in life and that it may be productive of the most fulminating hemorrhagic necrosis of the gland. We may infer that the lesser and chronic types of inflammation also may result.

It is not the intention of this paper to deny the importance of this mode of infection, but rather to ask if it has not been overworked as an explanation of the swellings and indurations we are noting so commonly in connection with other abdominal inflammations, particularly in disease of the biliary tract.

The profession at present apparently has resolved the etiology of pancreatitis in connection with biliary disease into the simple picture of infection sailing down the common bile duct and up the duct of Wirsung. The walls of the vessels receive no attention. Yet it is in the walls of the gall-bladder and ducts that the infection chiefly lurks. It is not at all uncommon to find a culture of the bile negative when pronounced infection is evident in the tissues of the gall-bladder and ducts.

Of the 49 cases, in this series, investigated in the pathological laboratory of the German Hospital, the result of the cultures of the bile is as follows:

Bacillus coli	16
Bacillus typhosus	2
Sterile	24
Not culture	7
	—
	49

In acute infections of the biliary passages the surrounding tissues are greatly inflamed. Any organ in close relationship must be endangered by the proximity.

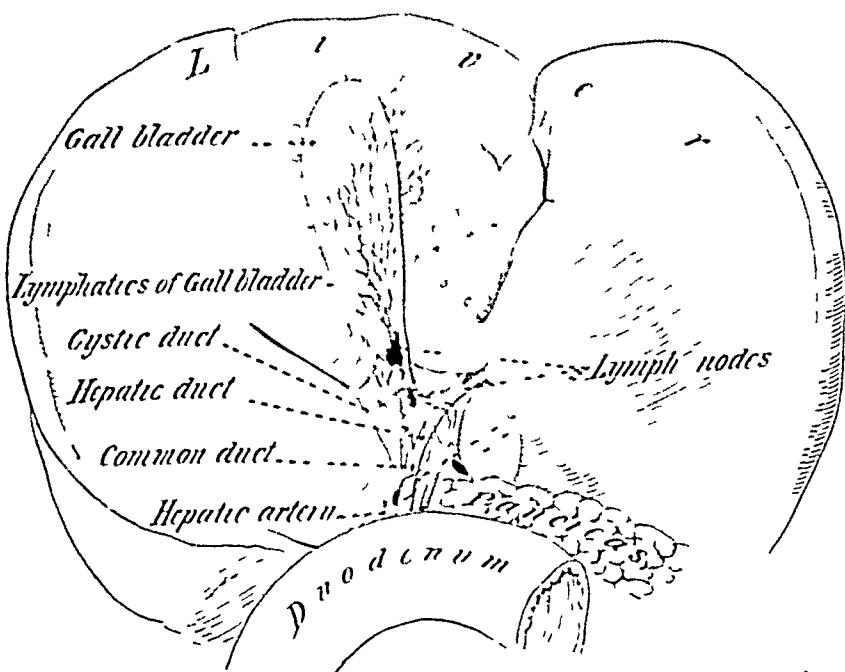
These swellings and enlargements of the pancreas, as noted by the surgeon, certainly differ from those states in which an overgrowth of the interlobular or interacinar fibrous tissue has taken place. There can be no rapid or material retrogression of the process which has progressed to a fibrous sclerosis. On the other hand it is characteristic of many of the swellings of the pancreas, as seen at operation, to subside more or less rapidly.

FIG. 1



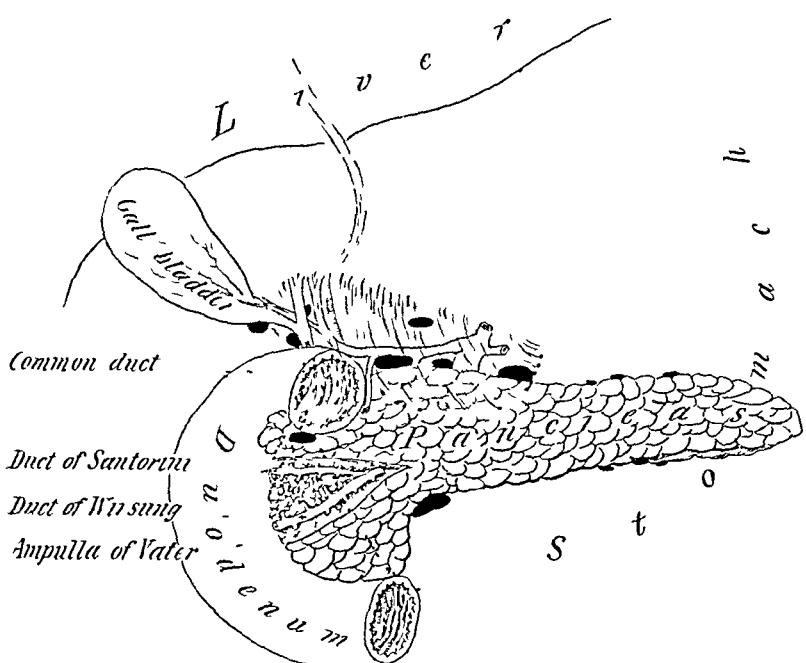
Duodenum and pancreas of newborn dog injected with 1 ml. I.V. It places an intimate connection exists between the pancreatic duct and I.V. After Bartels.)

FIG. 2



Lymphatics of the gall-bladder. The duodenum is turned downward. The lymphatic trunks are represented by dotted lines which may be seen disappearing behind the posterior surface of the pancreas to the surface of which they are intimately related (After Franke)

FIG 3



Black areas represent enlarged peripancreatic lymph nodes commonly encountered in pancreatic lymphangitis



and completely. This has been determined by secondary operations on patients who showed pancreatic swelling at the first operation, but none when the abdomen was reopened. Clearly the enlargement must have been due to engorgement and oedema or absorbable cellular exudates. It is only by accident that one could have the opportunity to secure for pathological examination a pancreas in this stage. Such an opportunity we have not had. Robson, however, speaks of such a case in which he operated for gall-stones, death occurring from apoplexy during the anaesthesia. A post-mortem examination of the pancreatic tissue surrounding the common duct revealed nothing abnormal to the naked eye, but a careful microscopic examination showed a small celled infiltration between the lobules of the pancreas and swelling of the secretory cells of the gland (*Surg., Gyn and Obstet.*, January, 1908).

Such minor changes as these in the ordinary length of time which elapses between the death of a patient and the post-mortem examination would be obscured by the rapid autodigestion which the organ undergoes and therefore has been overlooked. The condition has therefore received no attention or name from the pathologists.

A fact which is difficult to explain on the theory that such swellings result from duct borne infection is the usual localization of the lesion in the head of the organ, the tail, as a rule, being unaffected so far as can be determined by palpation. In the cases observed during the past one and a half years the head was affected alone in 42 cases, and in only 9 was the tail of the organ noted as showing any alteration in shape, size, or consistency. In 27 cases there was well-marked lymphadenitis of the glands in the peripancreatic tissue. It is not the rule in other glands, supplied by ducts which divide dichotomously, for ascending inflammation to be limited to the area adjacent to the terminations of the ducts. Thus, in cholangitis the fine radicles at the periphery of the liver show equal involvement with those near the portal fissure. In the pancreas itself the late lesions observed pathologically show sclerosis as marked in the tail as in the body and head. The so-called triangle of

pancreatic inflammation lying between the duodenum and the converging ducts of Wirsung and Santorini should not be so commonly affected to the exclusion of the remainder of the pancreas were the infection carried by the ducts, since the remainder of the pancreatic tissue is just as truly supplied by and dependent on these ducts as are the tissues of the triangle. In our opinion a more significant relation is to be found in the proximity of the common duct in its retroduodenal and pancreatic course to this portion of the head of the pancreas.

A path of infection to the head of the pancreas which has received too little attention is that by way of the lymphatics. In the excellent work of Robson and Cammidge on the pancreas, four lines are given to the anatomy of the lymphatics of the gland. In all the extensive literature on pancreatitis it is only rarely that the lymphatics are mentioned. Considering the importance of the lymph channels in both the transmission of infection and in recovery therefrom this neglect is unforgivable. The pancreas is well supplied with lymph vessels which run in the interlobular septa in company with the blood-vessels and ducts. Unlike the majority of glands, however, the pancreas possesses no great hilum through which emerge the blood and lymph vessels united into trunks of supply. The lymphatics emerge at various points along the course of the gland and make their way through the retroperitoneal cellular tissue to join the thoracic duct. In this retroperitoneal tissue they anastomose with lymph trunks coming from the stomach, duodenum, spleen, liver, gall-bladder, and bile ducts, the colon and even the left suprarenal. Probably still other intercommunications exist which have not yet been demonstrated. Bartels has shown that a particular intimacy exists between the lymphatics from the duodenum and the head of the pancreas.

Through the duodenal lymphatics he has injected vessels which are directly applied to the surface of the pancreas. These vessels anastomose with those coming from the head of the pancreas, and, while he did not succeed in injecting the intrinsic pancreatic lymphatics from the duodenum owing to the competency of the valves, he stated that under pathological condi-

tions the valves would not be likely to prove such an efficient barrier.

Franke has shown that a similar close relationship exists between the lymphatics of the gall-bladder and the head of the pancreas, and Arnsperger has argued the clinical force of such a relationship.

That gall-bladder and duodenal inflammations do cause marked peripancreatic lymphangitis is very easily made out. We have seen scores of such cases since we began to recognize the condition. In a fortunate case the march of the infection is easily demonstrated inflamed gall-bladder, enlargement of the cystic lymph-glands, peri-ductal lymphangitis, enlargement of the glands at the head and margin of the pancreas and often swelling of the regional lymphatic distribution of the head of the pancreas. In such a case it is not easy to resist the conclusion that the pancreas in this portion had become affected through the lymphatics rather than to assume that the infection had circumnavigated the ducts and localized itself in the pancreatic head.

The irregularly segmental distribution of the lymphatics of the pancreas harmonizes well with the localized areas of infection observed clinically. The lymphatics given off from the common duct in its pancreatic portion in the presence of a marked infection with much peri-ductal swelling and infiltration could hardly fail of being communicated to some extent to the neighboring pancreatic tissue, unprotected as it is by a dense and avascular fibrous capsule.

To the objection that infection, to be carried into the pancreas, must stem the efferent lymph current and force the valves, the answer can be made that everyone has seen infection in cellular tissues proceed in a reverse direction to the lymph-current. Thrombolymphangitis readily diverts the normal lymph course and infection easily destroys valves. The forces of pathology here as in so many other instances pervert the normal function.

The pre-operative recognition of pancreatic lymphangitis in the majority of cases is not yet possible. The greater part

of the pancreas remains unaffected and is able to furnish both internal and external secretions to supply all bodily needs. The local signs of inflammation, such as pain and tenderness, are not sufficiently distinctive to be separated from gall-bladder or duct inflammation or from duodenal disease. Occasionally it is possible to palpate the enlarged pancreatic head, but as a rule this cannot be done.

Cammidge's specific reaction "C" has not been of assistance to me. In the laboratory of the German Hospital we have carried out this reaction in upward of 700 cases and have found that it cannot be relied upon as indicating the presence or absence of pancreatic involvement. A Cammidge test was made in 10 of the cases in this series with positive result in 6 instances, negative in 4.

We may infer with fair certainty that the pancreas is affected in the more severe cases of long standing, particularly when the symptoms point to common duct involvement, with tenderness in the median line over the head of the pancreas. But we have failed to find pancreatic swelling in such cases, while in others of very recent origin it has been present.

Under this conception the problem of treating these inflammations resolves itself into the appropriate treatment for the primary infecting focus. The pancreatic and peripancreatic inflammations are analogous to cervical adenitis, secondary to tonsillitis or to inguinal adenitis following upon an infection of the extremity. The subsidence of infection in the gall-bladder, whether brought about by medical or by surgical means, is speedily followed by disappearance of the lymphangitis dependent upon it. In view of the fact that medical treatment, while at times successful, is notoriously slow and prone to fail, and in any case less likely to guard against recurrence, it must be regarded as attended by more serious risk of permanent damage to the pancreas.

If the early stages and milder degrees of involvement of the lymphatics of the pancreas may produce but little disturbance and disappear upon subsidence of the primary infecting focus, it is also true that any long continued lymph stasis and infil-

trations with damage of the tissue elements must lead to deterioration of the parenchyma and the deposit of fibrous tissue. Swelling of any portion of the pancreas to a greater or less extent causes obstruction of the ducts in that region, so that in this instance also we have the obstructive element added to that of infection.

In the more acute processes suppuration may ensue. Abscesses are most likely to be found in the head of the pancreas. An example of this condition is the following case operated upon in the University Hospital.

CASE II—I P., female, aged fifty-two years, admitted February 23, 1913.

Chief complaint, severe pain in right side of abdomen, nausea, and vomiting.

Past medical history, had typhoid fever when very small, otherwise no serious illness, but says she has never been strong.

Family and social history have no bearing.

*Present Illness*—For the last seven years she has been having "stomach trouble," eructations of gas, heart-burn. Six days before admission she was seized with severe pain in the right upper quadrant of the abdomen, which radiated to the left scapula. Has never vomited blood, has been habitually constipated, and at times noticed the stools were light in color. She never noticed any jaundice prior to this attack.

On admission, temperature, 98.6, pulse, 92, respiration, 20. She was well-nourished and of rather healthy appearance, though somewhat pale. Scleræ showed a slight tinge of jaundice.

Chest Negative throughout.

Abdomen Marked tenderness in epigastrum and right hypochondrium, with some rigidity and spasm on palpation. No masses felt.

Blood Red blood corpuscles, 5,600,000, white blood corpuscles, 16,800, haemoglobin, 85. Differential Polymorphonuclear, 92 per cent, lymphocytes, 5, transitional, 2, eosin, 1.

Gastric analysis Free HCl, 20, total acidity, 40, occult blood, positive. Fæces showed no bile and were otherwise negative.

*Operation* (February 28, 1913)—The gall-bladder was found filled with stones. It was acutely inflamed and very friable. The tissues around the common duct were swollen but the duct

itself did not appear to be dilated. There was much enlargement of the lymph nodes in the gastrohepatic omentum. The cystic gland was greatly enlarged, the head of the pancreas was swollen to the size of a man's fist with much peripancreatic infiltration, the tail appeared normal to palpation. The stones in the gall-bladder were removed and drainage instituted by a dressed tube. The common duct was opened and explored, no stones were present and the probe passed without difficulty into the duodenum.

The patient's condition was satisfactory after the operation, but during the following week she exhibited a septic temperature with attacks of dyspnea and palpitation, during one of which she died, March 8, 1913.

Only a partial postmortem was obtainable. The head of the pancreas was greatly swollen and contained several small interstitial abscesses. About the head of the pancreas there was also some suppuration in the peripancreatic tissues. The tail of the organ was slightly enlarged and on section showed a few flakes of fat necrosis.

Microscopic examination showed in the head of the pancreas chronic interlobular and interacinar pancreatitis with acute suppurative process implanted upon it, the tail showed also chronic pancreatitis, but to a much less marked degree. The acute changes also were distinctly less marked in the tail than in the head.

Reasoning from the pathological appearance we can believe that the head of the pancreas had been the seat of many previous attacks of inflammation. This portion of the organ had borne the brunt of the infection transmitted to it from time to time from the diseased gall-bladder. The history of the final attack together with the appearance of the gall-bladder indicated that the origin of the infection in this instance also was the gall-bladder and the lesser lesions, both acute and chronic, which were found in the tail can best be explained as secondary to the changes in the head of the pancreas.

It is not beyond the range of probability that certain cases of hemorrhagic pancreatitis may be initiated by infection reaching the pancreas through the lymph channels. It is certain that not all hemorrhagic pancreatitis is produced by the lodgement of a gall-stone in the papilla of Vater causing retrojection of the bile into the pancreatic duct. A fair per-

centage of such cases are not accompanied by gall-stones. Neither is it necessary that duodenal contents be regurgitated into the pancreatic duct in order that activation of the retained pancreatic ferment may occur. The hormone secretion arriving by the blood stimulates the secretion of pancreatic juice. Activation of the juice within the gland is not necessary to its digestive action as the clinical observations of fat necrosis and the post-mortem autodigestion of the gland will attest. With infection of the gland, obstruction of the ducts by a resulting engorgement and stimulation of the active pancreatic secretion by hormone action we have all the conditions necessary for focal necrosis of the pancreas, erosion of the blood-vessels, diffused hemorrhage followed by extensive gangrene and suppuration.

If we entertain these ideas of the causation of pancreatitis we must be influenced in our methods of treatment of the lesions of the gall-bladder and the duodenum when pancreatitis is associated.

Theoretically prompt removal of the focus of infection is desirable. Cholecystectomy and excision of ulcer must therefore be viewed from this angle. We have always been opposed to cholecystectomy unless strong indications were present. There is not sufficient time to discuss the pros and cons of this question in which many other factors enter. At this present time, however, we favor the more radical treatment of an obviously thickened and sclerotic gall-bladder when pancreatic lymphangitis is associated with it. In other words we are less disposed to take chances on recurrence of inflammation in the gall-bladder in cases where the fate of the pancreas is also concerned. It must not be forgotten that cholecystectomy is an operation of slightly greater mortality than simple drainage of the gall-bladder and we must therefore strike a proper balance between the immediate and remote dangers. Cholecystostomy in many instances is curative in a surprising manner and must remain the operation of choice in the majority of cases. Cholecystenterostomy should be reserved for those cases in which more or less chronic obstruction of the common duct is a feature.

## LARYNGECTOMY FOR CANCER \*

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THE legitimacy of operation upon any part of the body, especially those parts the damage of which may cause immediate danger to life, depends upon the answers which can be given to three vital questions. Will the operation result in the cure of the disease? Can the risks be overcome? What will be the extent of permanent disability? So uncertain until very recent years have been the answers to these questions as applied to laryngectomy for cancer, that it is not strange that the operation is one of the most recent developments in surgical history, having been first performed by Billroth in 1874.

Even after surgeons had become convinced of the possibility of the cure of intrinsic laryngeal cancer by this means it was, and is still, most difficult to persuade patients to submit to it—the instinctive objection to deep throat operations being the natural outcome of the experiences of the far distant past when the throat was the point of attack in our carnivorous evolutionary ancestors, and it being still the part most liable to danger in hand-to-hand conflict.

Does laryngectomy for cancer result in a cure of the disease? Upon our answer to this depends the need for considering the other two questions. We still accept Krishaber's classification of laryngeal cancer as intrinsic and extrinsic. As the term implies, intrinsic laryngeal cancer starts within the larynx itself in the vocal cords, the ventricular bands or the parts below, while the extrinsic form starts in the epiglottis, the arytenoids or other parts outside the larynx proper. Intrinsic cancer, then, is contained within a hyaline cartilage box and is practically cut off from the possibility of lymphatic involvements, while the extrinsic form grows

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\* Read before the American Surgical Association, May 7, 1913

rapidly and can easily and early extend through the lymph channels

Early diagnosis and removal is the keynote of safety in cancerous growths anywhere, and laryngeal cancer makes itself known almost at once, since from its very beginning the probability of its presence becomes evident in the persistent hoarse voice of the patient. We may say, then, that intrinsic laryngeal cancer exists, as it were, in a safe deposit box. It early announces its presence and has but feeble power of extensive invasion or of metastasis. We conclude, therefore, that this form of cancer of the larynx is curable by excision. Extrinsic cancer, on the other hand, is rapidly fatal, and operation for its relief is at best but a desperate remedy.

What is the surgical risk? I have myself performed twenty-seven laryngectomies for cancer with two operative fatalities, one death resulting from mediastinal abscess, the other from necrosis of the trachea with a consequent septic pneumonia. This makes a mortality rate of 7 plus per cent, a rate which compares favorably with that of the excisions for cancer of the tongue, of the stomach, and of the rectum.

What is the permanent disability of the patient? Those principally feared are impairment of speech, disfigurement, and a predisposition to pulmonary diseases and accidents. As to speech impairment, all patients acquire a buccal whisper which serves the purposes of speech remarkably well. One of my patients is at the head of a large industrial corporation, another is a judge, another is foreman in a public works department, another became a popular barber, still another is managing a small coal sales agency, one housewife apparently gets on well enough, and a farmer has managed his flocks and his teams in silence. The speech defect, to be sure, is great, but it can be compensated to a remarkable degree by the development of the buccal whisper, the use of gestures and other forms of primitive language, and by the adaptation of those individuals who come into daily contact with the patient.

The disfigurement may be well covered by wearing various

kinds of cravats or neckwear arranged in such a manner as to allow free breathing, and at the same time to diminish the sibilant sounds of the changing air currents.

As to the predisposition to accident and disease, to my knowledge there has been no instance of a foreign body in the respiratory tract of any of my laryngectomized patients, nor has there been a single case of pneumonia. Not only have my patients shown no tendency to pneumonia and bronchitis, but they have been remarkably free from nasal colds.

We may conclude, then, in answer to our third question, that though the disability resulting from laryngectomy is great, yet it is fairly well compensated.

Some years ago I made an interesting study of the laryngectomies reported in the medical press from 1873 to 1901. A summary of the statistics gives significant results. From 1873 to 1876, 12 laryngectomies for carcinoma were reported with one ultimate cure, making the percentage of ultimate cures 8.33. From 1876 to 1886, 108 laryngectomies, 21 ultimate cures, percentage of ultimate cures 19.44. From 1886 to 1896, 156 laryngectomies, 49 cures, percentage of cures 23.82, from 1896 to 1901, 30 laryngectomies, 20 cures, percentage of cures 66.67. The causes of death as reported are those with which we still are contending, but which improved technic has helped us in large measure to meet. Indeed, the figures just given show the increasing confidence of surgeons and patients in operative relief for this distressing disease, a confidence well supported by the rapidly decreasing mortality rate.

Before proceeding to a description of the general technic of the operation, let us consider how the special difficulties and dangers may be overcome.

i. *Pneumonia*.—Pneumonia following operation on the upper air passages is due in most instances to one of two causes (a) The inhalation of blood, and (b) the inhalation of infected wound discharges. These injurious inhalations occur usually in the course of the operation, although occasionally the post-operative oozing is inhaled. They may be

prevented in part by scrupulously maintaining a dry field in the entire course of the dissection. This is accomplished by picking up every vessel that is large enough to be considered at all, either before dividing it or immediately after it has been divided. In this manner the field will be kept so clear of blood that all anatomical structures may be easily seen and identified. During the later stages of the dissection the vessels which have been picked up may be ligated with either light catgut or light silk. While this manner of dissection may at first seem to be tedious, it will in the end prove to be the quickest method, and is the method of choice in dissections for the exposure of the larynx, pharynx, trachea, or oesophagus. When the field of operation has been reached, however, the prevention of blood inhalation becomes a quite different problem, because the blood supply of the mucous membrane is maintained principally by terminal arterioles which cannot be effectively controlled by ligation. At this point in the operation one of two courses may be adopted. The patient may be placed in a head-down, inclined posture at such an angle that the blood will gravitate away from the lung, or by the hypodermic use of novocain and adrenalin the trachea, the larynx, and the pharynx may be entered without resultant coughing or material oozing. If the mucous membrane has been locally anaesthetized the bleeding may usually be controlled by the local application of pledges of cotton pressed firmly against the bleeding points by haemostat forceps. The further control of hemorrhage depends upon the circumstances of the individual operation. If conditions permit, a rubber tube which will snugly fill the trachea or even distend it will entirely control the dangerous factor of blood inhalation. This point will be considered later in connection with the administration of the anaesthetic.

There are both advantages and disadvantages to the control of hemorrhage by posture, for the amount of hemorrhage, especially of venous hemorrhage, is increased by gravity. Then, too, the head-down position is less favorable for the operator. The direct control method has the advan-

tage of light, accessible position and the minimum bleeding In my experience I have rarely found it necessary to resort to the head-down posture, although it has been temporarily used, occasionally during some phase of an operation. Occasionally, of course, a great emergency may exist in which the head-down posture is urgently demanded.

*2 Local Infection*—The next great danger associated with laryngectomy is that of local infection, for it occasionally happens that after the air passages have been opened a serious local infection will spread over the contiguous territory and along the deep planes of the neck. The occurrence of some infection must be taken for granted, but it is for us to consider by what means the amount and the virulence of the infection may be diminished and how it can be localized. In the first place, the danger may be minimized in advance by canvassing all of the contiguous territories and making sure that there are not present any active foci of infection, such as decayed teeth, pyorrhœa, alveolar abscesses, discharging sinuses, peritonsillar abscess, pharyngitis, or purulent rhinitis. At the time of the operation itself we may control the local severity of the infection by using only sharp dissections and by minimizing to the utmost the trauma of surrounding tissues; by leaving no oozing of blood, by making careful decisions as to the immediate closure of the soft parts overlying the wound, and by using iodoform packing if there must be any wound in the soft parts of the throat and neck. When infection has been inaugurated there are no better therapeutic measures than the hot pack and the inhalation of medicated or plain steam.

*3 Mediastinal Abscess*—After pneumonia, mediastinitis and mediastinal abscess have been the most fatal after-results of laryngectomy. The onset of infection is usually a week or ten days after the operation, and is characterized by a steeple-chase temperature, not high, and always remitting in the morning. There is usually but little pain, and the course of the disease is toward slow, but certain death. In many respects it resembles the retroperitoneal abscesses which also

come late, are almost painless, progress slowly, show a steeple-chase, but low temperature curve, and end usually in death. The explanation of the characteristic, painless, tedious and fatal course of mediastinal abscess is probably found in the fact that this region of the body has always been protected from wounds by the bony chest wall. Being closed to wounds through the vast periods of man's evolution, it has been closed likewise to infection. The tissue of this protected region, therefore, has not been endowed with the elements required to efficiently meet and overcome infection as have been, for example, the peritoneum and the external parts of the body. In view of this fact, we must guard this helpless territory with special care. How can this be done?

As we have shown that pre-operative measures may in large degree prevent the extensive course of local infection, so the danger of mediastinitis may be guarded against by pre-operative protection. If in the course of the laryngectomy the divided trachea is stitched to the skin, there is great danger that subsequent coughing will cause it to become detached. Its moorings having been lost, it will be thrust back and forth, in and out of the thoracic box, like the piston of an engine. Mediastinal infection will be the almost inevitable result. If, on the other hand, the free end of the trachea is not fixed by sutures, but is held by gauze packing about it, then the trachea will retract within the thoracic cage like the head of a turtle, and again infection must result. It is obvious, then, that the trachea should be so fixed by preliminary operation that there may be produced an invincible barrier of granulations extending across the base of the neck and the entrance to the thoracic cage. There are two methods by which this may be done. The ordinary simple tracheotomy will fix the trachea and will stimulate the formation of efficient granulation tissue, or exposing the trachea and the lower larynx and packing the lateral planes of the neck with iodoform gauze will result in the production of granulations and in fixing the trachea so firmly that coughing cannot break its moorings. Each of these methods by itself alone has certain

advantages and disadvantages. The simple tracheotomy is not so certain a safeguard against infection of the mediastinum as is the latter, and it does not result in so firm a fixation of the trachea in the deeper part of the neck, but it has the advantage of establishing a strong defense mechanism in the mucous membrane of the trachea itself. On the other hand, the packing of the deep planes with iodoform, while otherwise an ideal protection, does not supply the protective defenses in the mucous membrane of the trachea. An ideal defense, then, is found in a combination of the two operations, that is, in opening and packing the deep planes of the base of the neck, and at the same seance making a low tracheotomy. By this means the mediastinum is put under strong guard, and at the same time the later technic of the laryngectomy is measurably reduced.

4 *Vagitis*.—Though a less frequent risk than those we have described, vagitis represents a formidable and special danger. In the course of the convalescence following laryngectomy, usually after the fourth day, a group of new symptoms is occasionally introduced; the pulse becomes very rapid and irregular in rate and rhythm—it may jump from 90 to 140 in a few minutes, the heart's action becomes tumultuous at times, the patient is quiet or perhaps a little apprehensive. Death from vagitis has been reported, though in my own cases the symptoms passed after a rather boisterous course of a few days. It is probable that the trunks of the vagi have become involved in the wound infection and as a result these nerves have been rendered unfit to properly conduct stimuli. Hence there arises the striking conflict between the vagus and the accelerator control, the picture being very similar to the immediate effect of crushing or dividing both vagi simultaneously. As a protection against this, one might utilize the well-known physiologic fact that the division of one vagus causes no notable change in the heart's action. In the course of extensive dissections for the wide excision of cancer of the neck I have eight times excised a portion of the trunk of one vagus. Close observation of the pulse and respiration de-

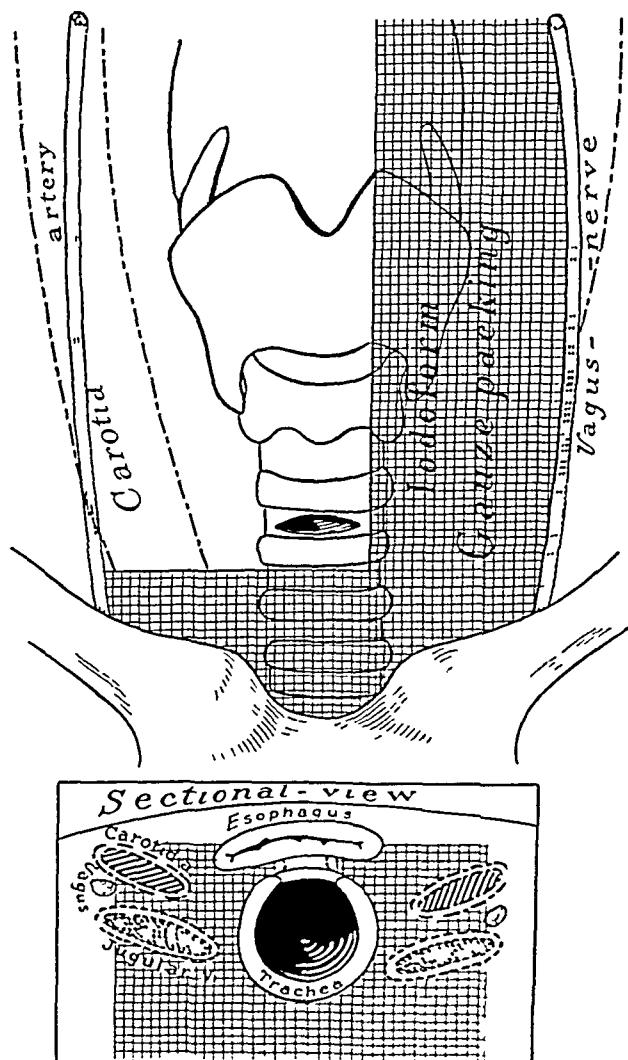
tected no change nor was any later alteration observed. Following this indication, then, at the preliminary operation one should carry the dissection on one side of the larynx all the way to the upper margin of the field of final operation, and should pack this territory with iodoform gauze just as the deep planes of the neck are packed. By this procedure one vagus must take the brunt of exposure and adjustment before the larynx is removed. By the time the laryngectomy is done this vagus would be readjusted and ready to resume its function in case it was affected at all, and so the heavy onslaught of the vagi upon the heart would not be made by both vagi simultaneously. In the case in which I tried this plan it seemed to be completely effective. When vagitis has become established there is little that can be done to alleviate it, although hot applications are apparently of some service.

*5. Reflex Inhibition of the Heart and Respiration through Mechanical Stimulation of the Superior Laryngeal Nerves—* This is a minor phenomenon peculiar to the surgery of this region, but it is reported to have resulted in several deaths and has caused much anxiety and trouble to those who have never known of its existence and who have not known how to interpret and obviate it. The terminals of the superior laryngeal nerves in the larynx and on the surface of the rima glottidis are of necessity disturbed, and the trunks of these nerves are divided in the course of operation. The function of the laryngeal nerves is the protection of the pulmonary tract from the entrance of foreign bodies. The slightest touch of their endings, therefore, causes a cough reflex, and a strong contact will cause an inhibition of respiration and of the heart. The nerve supply of the trachea has no such function, but the area of distribution of the inhibitory nerve endings extends over a part of the pharynx and a part of the posterior nares even. Fortunately, we have an absolute protection against this dramatic and sometimes dangerous phenomenon, in the hypodermic administration of  $\frac{1}{100}$  grain atropin (adult dose) before the operation. In addition a spray, a local application, or the local hypodermic injection of novocain will control absolutely the inhibitory reflexes.

6 The last special difficulty which we shall consider relates to the after care of the patient, and refers to the selection and care of the tracheal canula. After trying many kinds of canula, I have found that the common male or female curved canula or plain rubber tubing even, will answer all purposes. The greatest care should be exercised in adjusting the metal tubes so as to prevent a decubitus on the posterior wall of the trachea. Rubber tubing is preferred by some patients, but the metal tubes usually are best. A rubber tube drawn over a metal tube is perhaps the easiest to wear, but I have found that patients become careless with their familiarity with danger, and will wear loose-fitting tubes. This point was strongly impressed on my mind by the difficulty I once encountered in extracting a rubber tube that had slipped off the metal tube and had been carried deep into the trachea. After a stormy session in which the patient almost suffocated, the tube was caught by groping deep within the trachea with a curved haemostat forceps and it was extracted while the patient was unconscious from asphyxia. In time all laryngectomy cases get along without tubes. In fact, in my recent cases I have been able to dispense altogether with tracheal tubes, both at the time of the operation and ever afterward, and my patients have all preferred to get along without phonating apparatus.

*Anæsthetic*.—Before proceeding to the detailed technic of the operation itself, some special statement should be made regarding the manner of administering the anæsthetic. It should be borne in mind that the administration of the anæsthetic should be so planned that the operator may be unhampered in his technic, that the anæsthetist may give an even and safe anæsthetic, and that there may be no inhalation of blood, while the choice of the anæsthetic itself is a most important factor. Our general anæsthetic of choice is nitrous oxide. The patient already—it is to be presumed—in fear of the possible suffocating results of a laryngeal operation, takes this anæsthetic without the terrifying suffocating symptoms caused by ether, and is quickly under its influence without a struggle.

FIG. I



Schematic drawing to illustrate the method of packing the lateral parts of neck in form gauze at preliminary operation

FIG. 2

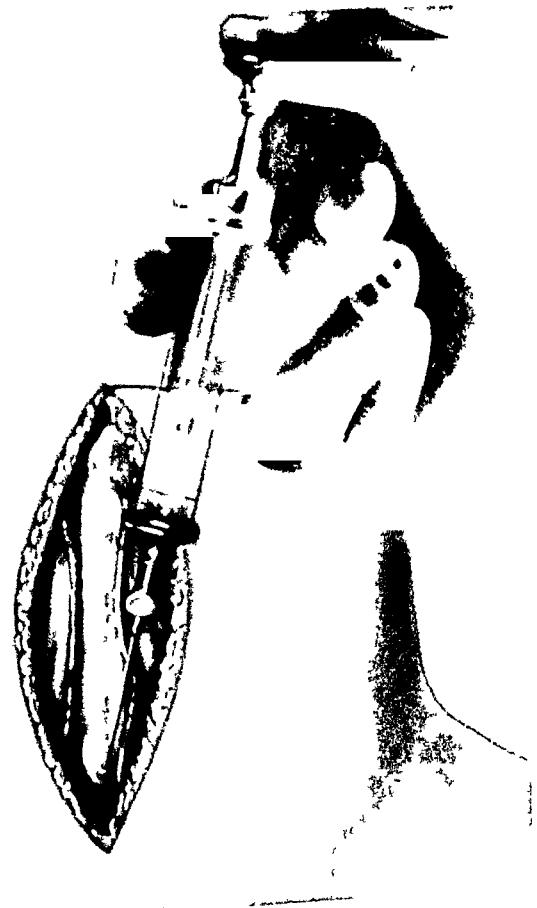


Novocainizing the superior laryngeal nerve endings of the trachea

FIG. 3

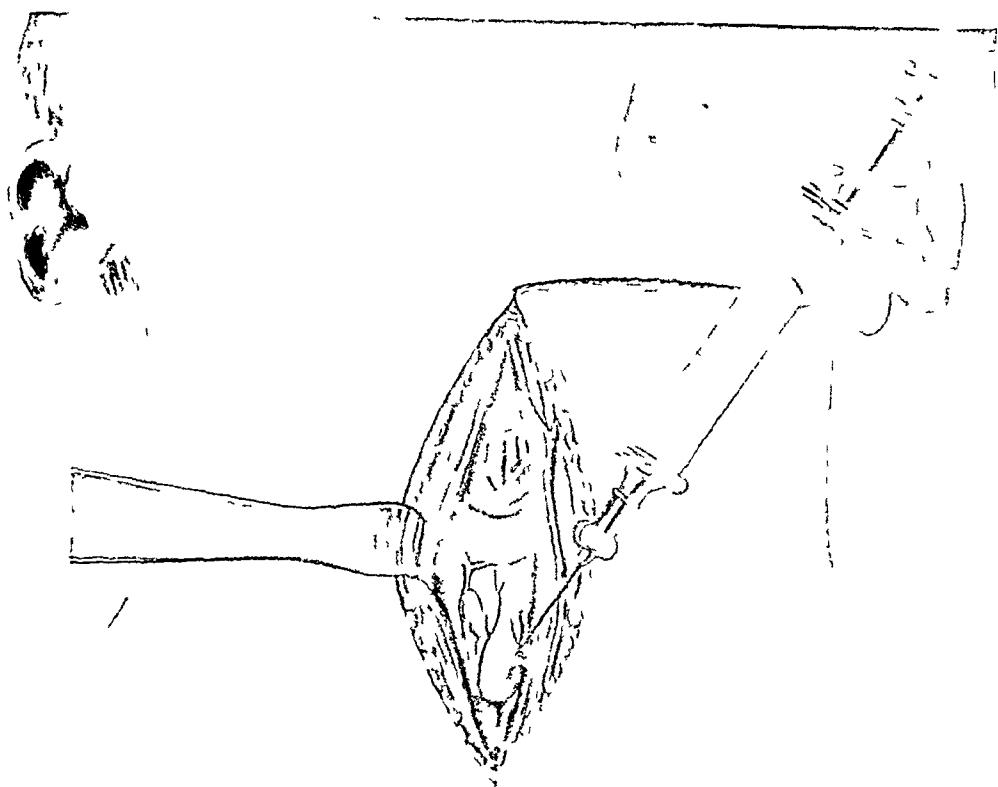


Infiltration of skin with novocain



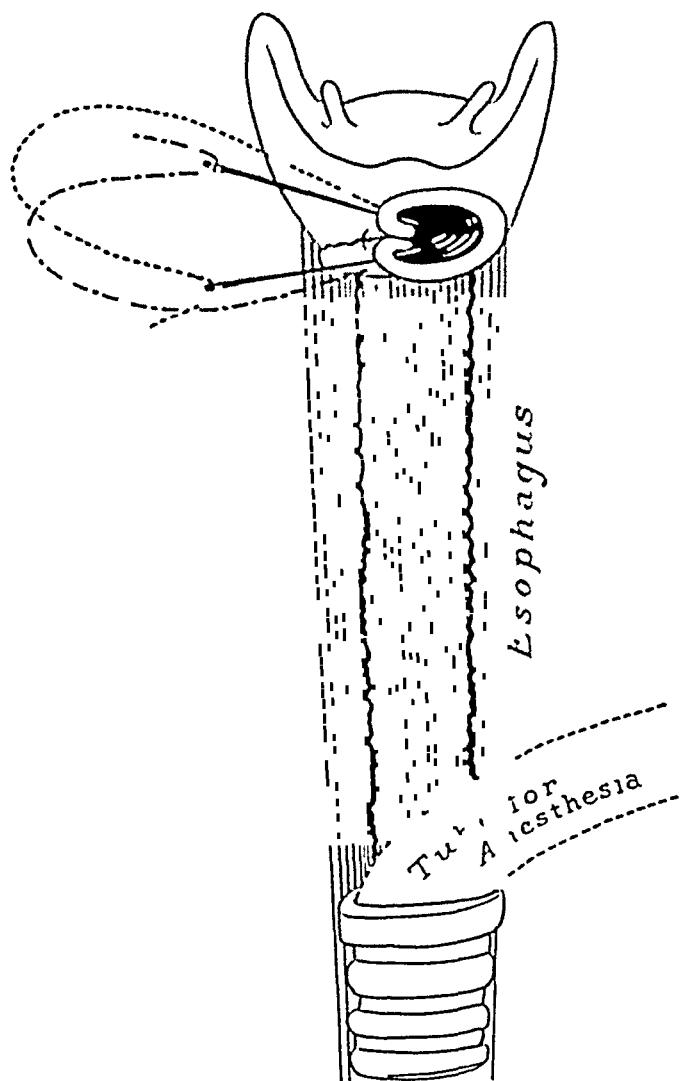
Infiltration of fascia with novocain

FIG 5



Infiltration of the deep tissues of the neck with novocain

Fig. 6



Shoemaker's stitch used in closing pharyngeal opening

We have proved also by laboratory experimentations that nitrous oxide hinders the general impairment of the patient, whereas ether is often an adjuvant to such impairment. Since nitrous oxide, however, should be given by the trained anæsthetist only, the following technic is equally applicable to the administration of ether. We have described already the preliminary tracheotomy by means of which the trachea has become firmly fixed in its position. At the time of operation the tracheotomy tube is removed and a well-lubricated, snug-fitting rubber tubing a foot or more long is slowly and carefully slipped into the trachea. The rubber tubing being slightly larger than the trachea, the latter is dilated and the rubber tube compressed, so that a fluid-tight fit results. By this means the entrance of any blood into the respiratory tract is prevented. The long piece of rubber tubing may then be attached to the oxygen apparatus, or it may be joined to a special apparatus consisting of a funnel covered with gauze upon which ether may be dropped. By this arrangement the anæsthetist is at a distance from the field of operation and is unhampered by the operator, while the operator on his side is unhampered by the anæsthetist. There results an even anæsthesia and the best opportunity for a well controlled operation.

To prevent nocuous impulses from the field of operation from reaching the brain, and as a protection against the excitation of special reflexes through the mechanical stimulation of the trunk or terminals of the superior laryngeal nerves, novocain is used as a local anæsthetic. The manner of its administration will be given in the description of the technic of the operation.

*Operative Technic*.—First the skin is thoroughly infiltrated with novocain along the median line from a point above the hyoid bone to the tracheotomy opening. The tissues are divided down to the box of the larynx, the divisions of the platysma and of the other soft parts being preceded also by novocain infiltration. The dissection is then carried down along the lateral aspects of the larynx until the larynx is

completely freed. If there is lack of free working space at the upper end a lateral incision is made parallel with the hyoid. The thyrohyoid muscles above and the sternothyroid muscles below are severed. So far as its muscular attachments are concerned, the larynx is now completely mobilized. If the laryngoscopic examination has fixed accurately the limits of the neoplasm, the level of the division of the larynx may be predetermined, and the next step will be the division of the trachea or the cricoid at a level free from disease. Before this last division is made, however, novocain is infiltrated into the mucosa throughout the entire length of the proposed division. By this means the terminals of the superior laryngeal nerves are completely blocked and the mucosa may be divided and the larynx opened without causing a change in the respiration or the circulation. If the patient is old and the cartilage is ossified, it is necessary to exert the greatest precaution in dividing the larynx in order that the oesophagus may not be injured. The divided end of the larynx is next raised up and the attachment between the larynx and the oesophagus is divided with knife or scissors. In a short, thick neck the wings of the larynx which extend down laterally to protect each side of the oesophagus, are divided with scissors. The dissection is then carried upward until the upper end of the larynx is reached, where its posterior wall becomes fused with the anterior wall of the pharynx. The upper end of the larynx is then cut free, the larger arteries being severed at the very last. Haemostasis must be most thoroughly observed throughout the operation. If the cancer is intrinsic the lymphatic glands which drain the diseased zone should be carefully removed with the larynx itself.

Two important questions now arise regarding the manner of dealing with the wound. (1) What shall be done with the end of the trachea, and (2) shall the entire wound of the neck be closed? As to the trachea, there are two alternatives, viz. It may be freed sufficiently to bring it forward and stitch it to the skin, or it may be left where it lies, excepting at its very upper end, which may be bent forward and sewed

to flaps of skin brought down from each side. The advantage of the first method is that by this means the trachea is protected from the inhalation of wound secretion. The disadvantage is the very definite possibility that the loss of blood supply may result in gangrene of the trachea. This did occur in one of my cases. The objection to leaving the trachea in its natural bed and transplanting to it the skin flaps is the fact that wound secretion will almost certainly enter it. By giving the wound adequate care, however, this danger may be avoided.

As to the care of the rest of the wound, my best procedure has been to suture the opening in the pharynx and, if possible, to re-enforce this suture by drawing other soft parts together over it. The rest of the field is left open, being packed lightly with iodoform gauze. With such a wide open wound the secretions may be easily controlled and prevented from entering the trachea. The patient should be sustained by the fullest diet he can be made to take, and by most careful nursing. The sutures in the pharynx may not hold, but the formidable-looking wound will close very readily by granulation and contraction.

Laryngectomy is followed usually by a brisk local reaction, but since the mediastinum has been protected by the previous gauze packing, and the bronchopulmonary tract has been given a special defense by the preliminary tracheotomy, the patient is well equipped to meet the new condition.

*Clinical Observations*.—In my twenty-seven laryngectomies there were two deaths, and these two were apparently the most promising cases of all. The prognosis in these cases seemed so favorable that I ventured to discard the full preliminary preparations. In one case I made no preliminary protective operation of any kind, and the patient died at the end of five weeks with mediastinal abscess. In the other case I made a preliminary gauze packing in the neck around the trachea, but did not perform a preliminary tracheotomy. In this case I brought the isolated upper end of the trachea forward to the skin and anchored it. The entire isolated portion

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- COLT, G. H.: Reduction of Fragments Preliminary to Internal Splintage in Fractures of the Long Bones, 490.
- CONNELL, KARL: Accuracy in Anæsthesia, 877.
- COTTON, F. J.: Deaths from Anæsthesia, 934.
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- DAVIS, JOHN STAIGE: Excessive Thickening of Thiersch Grafts Caused by Use of Scarlet Red, 451.
- DAWBARN, ROBERT H. M.: Recurrences after Operation for Hernia, 678.
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- DEAVER, JOHN B.: Pancreatic and Peripancreatic Lymphangitis, 151.
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- DESPARD, DUNCAN L.: Subdiaphragmatic Abscess, 334.
- Diastase, Urea and Phthalein, Value and Limitation of in Estimating Renal Function, 800.
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- Dislocation of the Shoulder, Operative Reduction of Old, 542.
- Diverticulitis of the Sigmoid, 356.
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- DOWN, CHARLES N.: Cardiolysis, 662; Hygroma Cysticum Colli, 112; Observations upon Surgery of the Stomach, 272; Results of Bone Injuries in Children, 275.
- DOWNES, WILLIAM A.: Rectus Transplantation in Certain Cases of Inguinal Hernia, 677.
- DUNHAM, THEODORE: Rib-Finder, 685.
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- Duodenal Ulcer, Cases of, 664; Perforating, Pyloroplasty for, 414; Pyloric Exclusion for, 697.
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- Echinococcus of the Liver, 697.
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- Electric Bath, Relief of Endarteritis obliterans by, 670.
- ELSBERG, CHARLES A.: Some Surgical Features of Injuries of the Spine, 296.
- Embolism and Thrombosis of the Superior Mesenteric Artery, 459.
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in selecting proper persons as members of the hospital staff. With regard to nurses, although primarily the servants of the governors, they took their orders from and were under control of the surgeons during an operation, and thus in respect of duties so performed, ceased to be the servants of the governors.

In the Edinburg Sheriff Court, in 1909, damages were awarded to a plaintiff, who claimed them, in respect of injuries sustained by her through being burned by a hot-water bottle, when under an anæsthetic for an operation. The claim was made against the Edinburg Hospital and Dispensary for Women and Children, and the Sheriff Substitute, who found for the plaintiff, adopted a contrary view of the law from that enunciated by the Court of Appeal in the case of *Hillyer v. The Governors of St. Bartholomew's Hospital*. The judgments of the Court of Appeal of England are not binding on the inferior courts of Scotland and *vice versa*, although they are often cited and generally receive the consideration due them.

From the foregoing it is apparent that the conscientious anæsthetist is in duty bound to exercise every possible precautionary measure to prevent anæsthetic or postanæsthetic accidents, unless he wishes to involve the operating surgeon or his hospital in an action for malpractice or damages.

There are several decisions under the English Workmen's Compensation Act, with regard to anæsthesia, which are of importance. The case of *Bourne v. The Middle-Sussex Water Board* has already been quoted, and under its ruling, working-men not fit subjects for anæsthesia cannot be forced to undergo operations for the mitigation of their disability. In *Shirt v. Calico Printers' Association Lim't'd*, the Master of the Rolls, on appeal, allowed the claim of a widow for compensation under the Workmen's Compensation Act, on account of the death of her husband under chloroform, while submitting to a second operation of skin-grafting, to minimize his disability consequent upon an accident. This ruling has been followed in several cases, but in *Charles v. Walker Lim't'd*, the widow's claim in respect to the death of her husband, under renewal of anæsthesia for a purpose other than the surgical intervention necessitated by his accidental injury, was disallowed.

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The facts in this case were as follows: The widow of the deceased workman claimed compensation in respect of his death, which took place while he was recovering from an anæsthetic administered to him for the amputation of a finger, injured by an accident; the anæsthesia being re-

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newed in order that a tooth, from which he had complained, might be removed. The county-court held that: It was at least as probable that death had been due to spasm caused by an attempt to swallow blood oozing into the mouth, as that it was due to the anaesthetic administered for the first operation, and decided that consequently the widow had not made out her case. The Court of Appeal held that: the county court had rightly directed himself, and that the claimant had failed to discharge the onus which lay upon her to prove the facts upon which her claim depended.

This case emphasizes the absolute necessity of limiting anaesthesia to the operative procedure demanded under the Workmen's Compensation Law, in order that dependents may recover compensation in the event of an anaesthetic fatality.

In order to fully understand the not infrequent prosecution of hallucinatory and delusional false charges of *rape* under the influence of anaesthetic drugs, it becomes necessary to emphasize the fact that erotic sensations, such as women experience during sexual intercourse, occur during the induction period of narcosis. In two instances the author has observed this phenomenon, personally; and once, during the induction of anaesthesia, the actions of a young woman were of such a character as to embarrass all those who were present in the operating-room, although there was fortunately no realization post-operatively of the sexual excitation.

The mystery which has been allowed to surround the subject of sexuality is responsible for the unscientific delicacy with which the inquiry into the subjective sensual sensations of women has been pursued. But if these erotic hallucinations or fixed delusions take the practical form of a charge of rape, preliminary confinement to jail and a trial by jury, they pass from the domain of sentiment and enter the realm of legal medicine for investigation and adjudication.

Comparatively few members of the medical or legal profession sufficiently realize that women, during the induction period of narcosis, are subject to hallucinatory and delusional sensations, identical with the eroticism and orgasm associated with the sexual act. These erotic sensations arise quite subjectively, and without any extrinsic stimulus, aside from the

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coincidental administration of the anæsthetic. The delusion of St. Catharine that the devil visited her and violated her person, when she was asleep and could offer no resistance, is no unique experience. Everyone familiar with asylum supervision knows that a certain percentage of women patients have this delusion, among others, that the medical superintendent comes nightly to their bed and enjoys their person during sleep. There is absolutely no foundation in fact for such delusions except the subjective, erotic sensations of these women.

How strongly such erotic delusions may become fixed in women's minds is evidenced by unfounded charges of rape by women, who have persisted in their belief, when relations or others were present during narcosis, under circumstances that rendered criminal assault physically impossible. Such being the case, it is advisable always to have another person, preferably a woman friend or attendant, present without intermission during the whole time that a female patient is under the influence of an anaesthetic, and that such other precautions be taken as will preclude the possibility of an unfounded charge being raised.

While designing women have occasionally brought false charges of rape for purposes of blackmail; or when already pregnant, in an effort to fix the parentage of the prospective infant upon some innocent medical man, still in most instances when hallucinatory or delusional false charges of rape have been pressed, modest, virtuous and refined gentlewomen have been the accusers.

Dudley Buxton in commenting on this subject says that: Chloroform, ether, nitrous oxide and even cocaine possess the property of exciting sexual emotions and in many cases produce erotic hallucinations. In certain persons sexual orgasm occurs during the induction of anæsthesia. Women, especially when suffering from ovarian or uterine irritation, are prone to such hallucination, especially during the menstrual period.

Turnbull in his Artificial Anæsthesia, quotes the case of *Child v. Dash*, which was tried at the Northampton Assizes, Nov. 9, 1877, by Mr. Justice Hawkins. After lying in jail from the 14th of September to the date of

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trial, this surgeon's assistant was finally acquitted on a delusional charge of rape under anaesthesia, the accused being entirely cleared of any imputation in respect to the charge preferred against him.

Within a year of Morton's discovery of the anaesthetic effects of ether, the *Gazette Medicale* (Paris), July 31, 1847, reports the first recorded case of criminal assault under anaesthesia.

A patient went to a dentist to have a tooth extracted, and to avoid pain, he recommended her to inhale ether. The young woman was observed to leave the dentist's house in a very disordered state about three hours after entering it. This attracted the attention of her employer, who could not account for her long absence. The injured party, notwithstanding the effects of the ether, retained some recollection of what had transpired, and from some intimations she let fall suspicion was immediately aroused. She was examined by a physician who reported that her person had been violated. The dentist was arrested and prosecuted.

Taylor in his *Medical Jurisprudence*, quotes the law regarding criminal assault and narcosis as follows:

When narcotics or intoxicating liquids have been administered to a woman either by the prisoner or through his collusion, it matters not, in cases of rape, whether the narcotics have been given merely for the purpose of exciting the female, or with the deliberate intention of having intercourse with her while she was intoxicated or unconscious,—the prisoner is equally guilty.

In the case of *Reg. v. Snarey*, Winchester Lent Assizes, 1859, for criminal assault under the influence of an anaesthetic, there was a clear attempt at fraud. The prosecutrix asserted that she was instantly rendered insensible by the prisoner forcibly applying a handkerchief, saturated with an anaesthetic, to her face, and she accused him of having committed rape upon her. The charge was disproved by a distinct alibi, as well as by the improbability of all the circumstances. In a parallel case, that of *White v. Howarth*, the prosecutrix made a similar assertion, and added that she was aware of what was going on, but was unable to resist.

In attempts at criminal violence under an anaesthetic administered without the victim's consent, fear, excitement and struggling would all be against the possibility of arriving at a loss of voluntary power without deep narcosis. It is very doubtful whether a person, be he an expert or not, could anaesthetize a waking adult against his will, unless there existed a very unusual disproportion between the strength of the two individuals.

Also there is something suspicious about the attempted use of anaesthetics in burglary. Persons left to guard banks and

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other places containing valuables have on numerous occasions affirmed that they were rendered unconscious while robbery was committed, but in almost all these instances, the persons uttering the charges have been either the actual depredators or in collusion with them. This subject opens up the question as to whether people can be anæsthetized during sleep. There is not time at our disposal to discuss this problem, but the reminder of Taylor is apropos. "*Non omnes dormiunt quae clausos habent oculos.*" Not all are asleep because they have their eyes shut.

Occasionally in the routine of hospital service it becomes necessary to anæsthetize patients who are the victims of attempts at murder or manslaughter. Needless to say some of these patients are almost *in extremis*. However, if the anæsthetist uses skill and care he has nothing to fear, judicially, in case of a fatality. The Amer. & Eng. Encyl. of Law, quotes the following law on this subject:

Although a wounded man may die of strangulation produced by an attempt to administer restoratives to him, or from a surgical operation honestly believed to be necessary or from chloroform administered to facilitate such operation, or from an accident occurring during its performance,—yet as death from any such causes is directly referable to the original injury, this is to be regarded as the judicial cause of death.

In such cases, however, the anæsthetist for his own protection should keep a careful record of his procedure in administering the anæsthetic, as he may be called upon to testify in court.

In 1907, the Council of the British Medical gave notice that any registered medical practitioner his presence, countenance, advice, assistance or c knowingly enables as unregistered person to atti

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A personal experience in which the author is morally certain that a gynaecologist of standing, performed a criminal abortion under the guise of a curettage for endometritis, emphasizes the fact that an anæsthetist may unconsciously be misled into administering an anaesthetic for an illegal operation. In the event of the anæsthetist becoming familiar with the illegal nature of the proposed operation previous to the induction of narcosis, he would certainly be incriminating himself by continuing in the case. Likewise, should there be a suspicion of fraud with regard to the proposed operation, or any indication that it was being performed to obtain money under false pretences, the anæsthetist would do well to retire from the case.

In the Brompton County Court, March 11, 1907, a point of some interest was raised in respect of fees due for the administration of an anaesthetic. The plaintiff, an anæsthetist, claimed 10 guineas from the surgeon defendant, for 10 administrations of an anaesthetic to the latter's patients, contending that it was the custom for the medical man in charge of a case to hold himself responsible for any fees due to an anæsthetist. This was necessary because knowledge of the patient in so far as the anæsthetist was concerned and the relationship between them began and ended with the performance of the operation. Evidence for and against this view having been given by various persons the judge ruled that:

"The custom existed and gave judgment for the plaintiff for 6 pounds; this being an average between the fees variously stated as commonly paid anæsthetists."

The further question of a contract assistant's right to anaesthetic fees for services rendered another practitioner has been recently raised in England and has been disposed of as follows:

"Under the usual contract between a medical principal and his indoor assistant, the latter is required to give the whole of his time to the principal, and any professional remuneration he is paid belongs, legally, to the principal. The assistant's contract does not oblige him to work for another practitioner,

but if he does, he may not receive for himself a fee without the consent of his principal, and it is his duty to proffer him the fee."

In passing it is only possible to mention the value of anæsthesia, medicolegally speaking, in unmasking those who are malingering. M. Baudens, surgeon in the French Army, was the first medical authority to utilize ether anæsthesia as a means of exposing malingering. As early as 1847 he published two personal and illustrative cases of the practical application of ether to medical jurisprudence to distinguish feigned from real disease. Since that time the method has become a routine medicolegal procedure.

Before closing I wish to revive interest in a carbon tetrachloride death, which occurred in the shampoo parlors of the Harrodd's Department store of London, and which resulted in a trial for manslaughter. This sensational case was discussed in detail in the medical journals of 1909, and the *Jour. of the A.M.A.* in its Paris Letter, May 31 of this year, announces that Dr. Levassort has brought the subject of dry shampoo to the attention of the prefect of police and the Council of Public Hygiene and Health of the Department of the Seine, because of the danger of death from the fumes of carbon tetrachloride. On account of the prevalent use of certain dry-cleaners in the United States, the trade names of which betray the presence of this poisonous volatile anæsthetic, it would seem that this association might take some action in the matter of investigating the problem and issuing a warning against their use.

In closing, the remarks of Mortimer on the anæsthetist's conduct in court are especially apropos; he says that:

"In giving evidence that the anæsthetist should follow the general advice given to medical witnesses in books on Forensic Medicine. He should study the subject of inquiry carefully beforehand, considering what questions are likely to be put to him, how his evidence may be regarded by any one outside the medical profession, and any weak points which may be seized upon to his disadvantage. If coming before the

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Stewart's Manual of Surgery, Review of, 862.

coroner, or a magistrate, or a county court judge, he should remember that the case may be carried further, and copies of his evidence given in the first instance, produced in the second, and that there should be no discrepancies from carelessness or lapse of memory between the evidence given on the two occasions.

"He should give his answers deliberately and distinctly, pausing at the end of sentences so that his testimony may be taken down. Any approach to levity, irritation or discourtesy should be avoided under all circumstances. Answers should be given in language, free as far as possible from technical terms and also from vague and exaggerated expressions. Answers should be limited to the questions asked, and the anæsthetist should confine himself to facts, unless required as an expert to comment on them. He should object to involved, suggestive or hypothetical questions, and should appeal to the judge for permission to explain when a categorical answer would be misleading. Arguments and theoretical discussions are also to be avoided. No decided opinion should be expressed on insufficient data, and therefore one as to the cause of death should not be given in the absence of an autopsy, preferably conducted with the assistance of a skilled pathologist."

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Abdominal viscera of the little ant-eater with the intestines rotated to correspond to the development in the human subject.

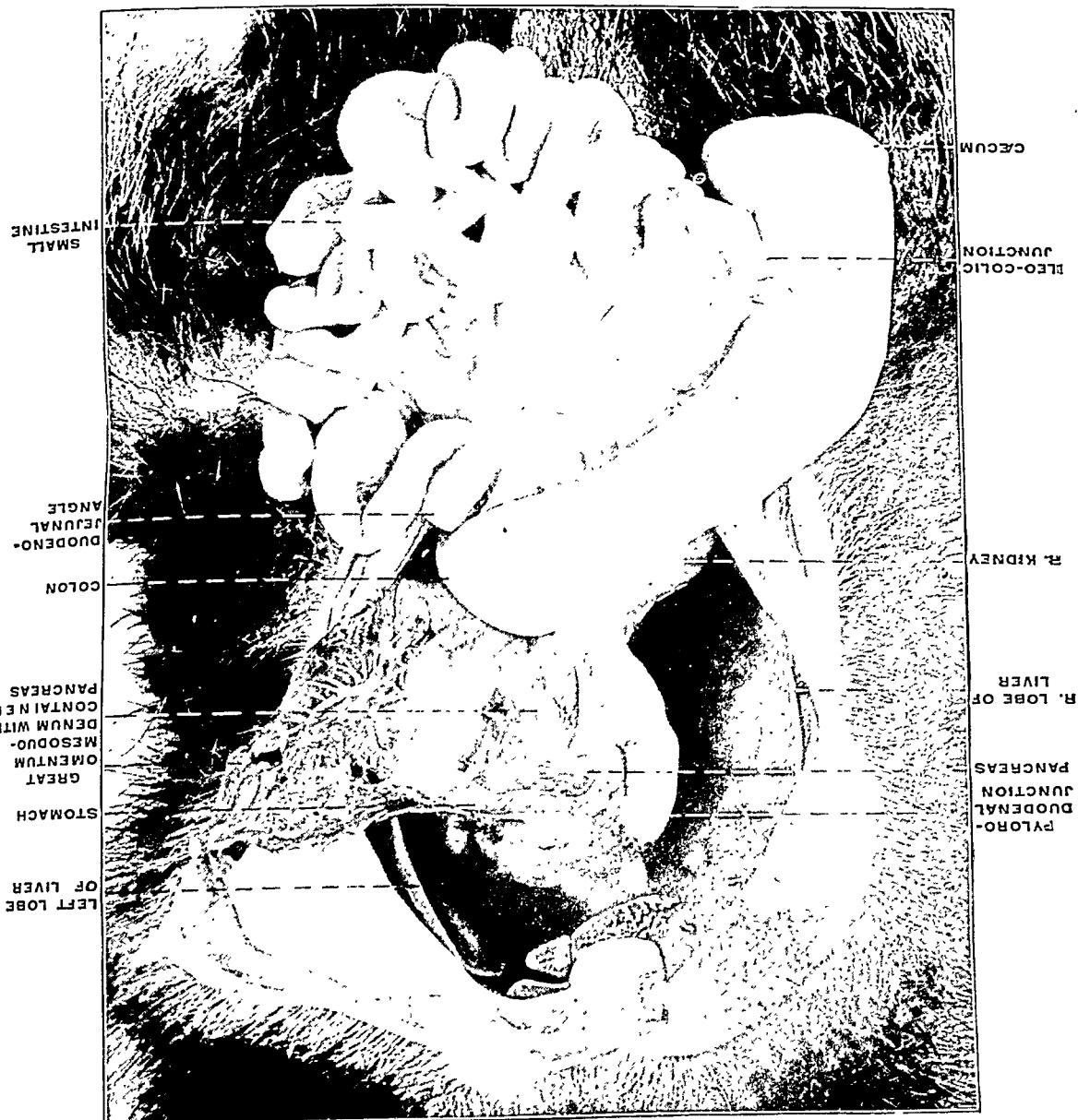


FIG. 6.

Points at which the intestine was divided.

Points of lateral anastomosis.

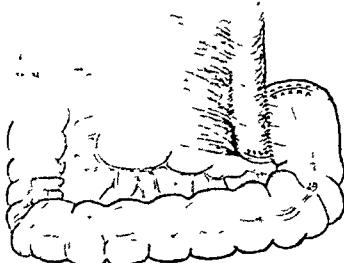


FIG. 9.

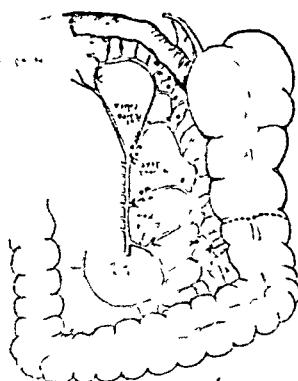


FIG. 8.

Microphotograph, times 700. Section of adjacent lymph node showing tumor metastasis in sinus.

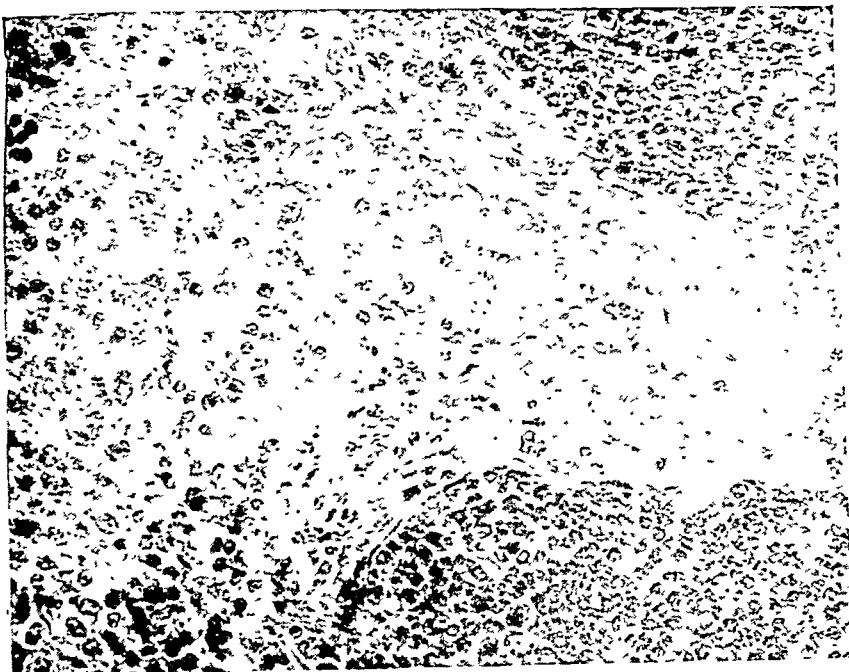


FIG. 7

Abdominal viscera of adult human female, in a case of arrested rotation of the intestines

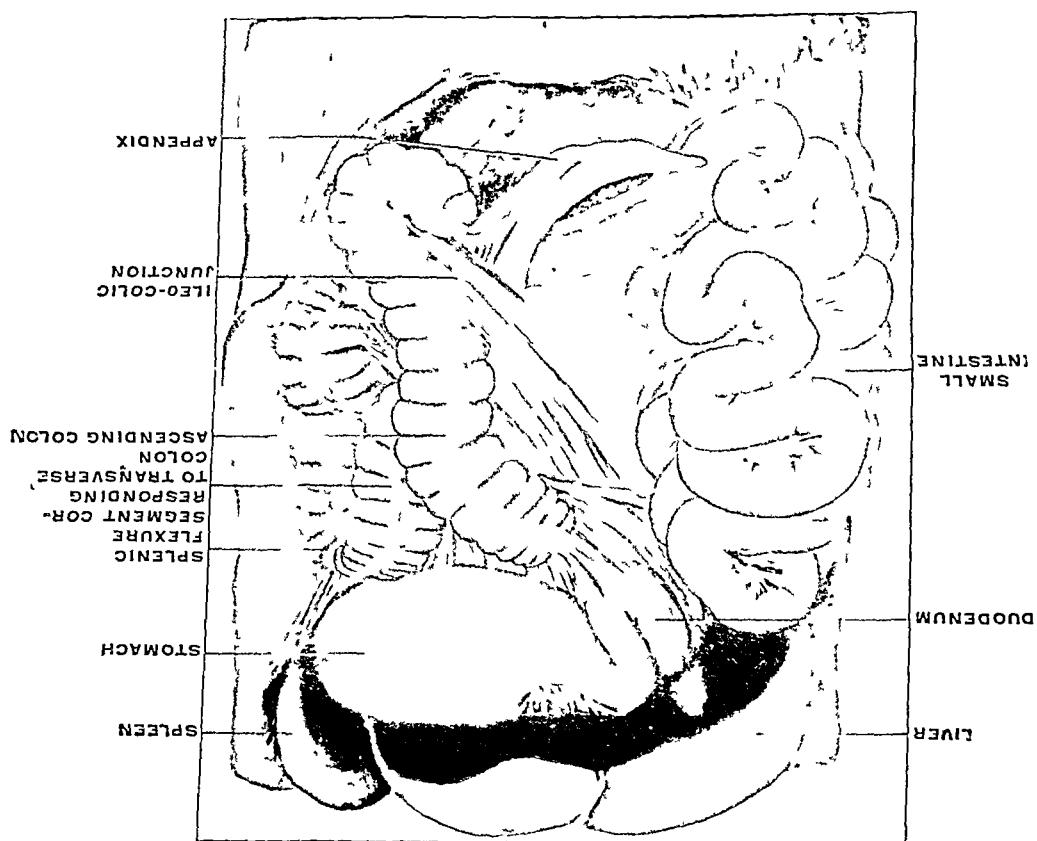


FIG 7

lous care and the wounds are closed without drainage. There has been no death in this group from operation although, in general, it includes the most serious cases, so serious that, in the majority of them, preliminary ligation of one or more arteries was done. In one case the four arteries were tied, at as many operations, before the lobectomy was hazarded.

Kocher having emphasized the importance of lymphocytosis in hyperthyroidism, a differential leucocyte count has been made. Almost invariably the proportion of lymphocytes was increased, once being as high as 65 per cent. But in one case, the most serious of all, the total percentage of lymphocytes was only 9. It has particularly interested Dr. Halsted to observe that there has been a gradual reduction, after operation, of the lymphocytosis in these cases.

The role of the thymus in Graves's disease is probably of great importance. With the advances in skiagraphy it has become possible to detect enlargement of the thymus too slight to be determined by percussion. It seems probable that in a very considerable large percentage (75 per cent. or more) of the pronounced cases the thymus is enlarged.

The hyperplastic thymus may be in great measure responsible for the disproportionate number of the mononuclear leucocytes. In one of the cases, a boy, aged sixteen years, with only mild hyperthyroidism, the lymphocyte percentage was 56, and there was enlargement of the thymus so great that Dr. Halsted could easily remove a part of it from the ordinary collar incision of Kocher.

In none of the cured cases which returned for observation during the past winter was evidence of persistence of the thymus found skiographically, and in none of these was the percentage of lymphocytes above 33.

The tendency, after removal of one lobe, is toward lessening the hyperplasia in the other. This tendency is probably greatest in the cases which improve most. In these, unfortunately, we have no opportunity to see the other lobe, for there is no indication to excise it.

When the second lobe is removed it is always because

## NON-ROTATION OF THE INTESTINE.\*

ITS RELATION TO HIGH, RETROCÆCAL AND ABERRANT POSITIONS  
OF THE APPENDIX.

BY ARTHUR SEYMOUR VOSBURGH, M.D.,

OF NEW YORK.

THE frequency with which one meets, in operating, the abnormally placed appendix, and the difficulties encountered in dealing with it, often through a badly placed incision, seem to warrant a review of the subject.

The most frequent variation is the "retrocæcal" appendix. By this I mean an appendix actually extraperitoneal, in whole or in part, by reason of secondary adhesion in the process of development, and not extraperitoneal as a result of segregation by a protective peritonitis.

Rarer forms are those where we find the appendix in the region of the liver, approximating the median line, or in the left iliac fossa. In these latter, more advanced forms of arrest of development, we are apt to find the ileum entering the cæcum on the right side.

The difficulties of these cases are further increased by failure in early diagnosis. They come to the hospital late through lack of prompt recognition, or we, beset by the same difficulties of diagnosis, fail to give the prompt relief demanded. We have in consequence to deal with an inflammation far advanced, with bowel and mesentery unduly thickened, rendering the gut difficult of manipulation.

The extraperitoneal retrocæcal forms fail to give us the telltale symptoms of peritoneal involvement, with its characteristic rigidity of the adjacent abdominal wall.

Some of us have observed cases of well advanced peritonitis, where we have failed to elicit the symptom of abdom-

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\* Read before the New York Surgical Society, October 9, 1912.

lous care and the wounds are closed without drainage. There has been no death in this group from operation although, in general, it includes the most serious cases, so serious that, in the majority of them, preliminary ligation of one or more arteries was done. In one case the four arteries were tied, at as many operations, before the lobectomy was hazarded.

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When the second lobe is removed it is always because

inal rigidity. On opening the abdomen in such a case, the explanation has been found in the fact that the inflammation has been confined chiefly to the visceral and mesenteric peritoneum.

Dr. Charles N. Dowd has recently emphasized this symptom in an article in the *American Journal of Surgery*, June, 1912, entitled "Some Peculiarities of Deep-Lying Abdominal Inflammation." He summarizes as follows: The parietal peritoneum, supplied through the peripheral nervous system is rich in sensation, while the visceral peritoneum, deriving its nerve supply from the sympathetic system has no nerves sensitive to pressure, heat or cold.

The failure of deep-seated appendicitis to conform to the classical train of symptoms, which renders diagnosis comparatively easy, and the mistakes into which I fell, by this same failure, aroused my interest in this subject.

Among my private and hospital cases of appendicitis I find ten of abnormally placed appendix. Nine retrocaecal, and one where the appendix abscess was in contact with the liver. This last I will describe in detail.

CASE.—Albert K., son of Italian parents, five years old, was admitted to the first surgical division of Bellevue Hospital on August 1, 1912. Nine days before was taken sick with pain in the upper abdomen. Vomiting kept up all the first night. A private physician gave him some medicine which relieved him for the time being. Two days before admission pain became worse, and he was confined to the bed. Pain was of a cramp-like character. Bowels moved daily. On admission, temperature  $103^{\circ}$ , respirations 28, pulse 140, leucocytes 4300, polynuclears 85 per cent. Tenderness over whole of right side. Right rectus held rigid. Abdomen not distended. Maximum rigidity, right upper quadrant.

Diagnosis, high appendicitis.

Operation (August 1).—Right rectus incision above level of umbilicus. Transverse colon presented in the wound. This and parietal peritoneum seemed normal. No free fluid. On further examination a mass was felt in contact with the liver,

have said, precisely to the line of the lobectomy wound of the skin; and in the making of the latter the fine scars of the former are excised.

2. The wounds made for ligation of the inferior arteries are partly outside of the field of the lobectomy operations, whereas, when the superior arteries have been ligated, a considerable part of the operation for removal of a lobe is through freshly healed, matted tissues whose resistance to infection is lowered. Although suppuration is not very likely to take place even when two or three operations are performed at short intervals through the same tissues, the reaction is greater and breaking down of the wound quite possible.

3. As the inferior thyroid artery is usually larger than the superior, the effect of the ligation may be greater.

4. The superior artery, or arteries, are regularly tied in the course of lobectomy; hence when both inferior arteries have been tied and a double lobectomy is performed all four of the thyroid arteries will have been occluded. On the other hand, if the superior arteries had been ligated at the preliminary operation, the portions of both lobes remaining after a double lobectomy would receive a fuller blood supply.

5. The location of the inferior artery is less variable than that of the superior vessel, which is subject to great changes because of the inconstant position of the superior pole.

The ligation of all the structures of both superior poles through an incision which stretches across the neck—a procedure which has considerable vogue—does not seem quite rational to me for the reason that the results would not be likely to be adequately proportionate to the magnitude of the operation. The ligation of all four of the arteries through small incisions such as I have described, would hardly be more formidable than the operation just referred to and the benefits would, I believe, be greater.

The danger of tetany from the occlusion of the four arteries is probably not so great as I formerly supposed, provided that the ligations are done neatly and at safe distance from the parathyroid glandules. Ligation of the four arteries

which on investigation proved to be an appendix abscess walled in by the cæcum and the ascending colon. The cæcum was bent on the ascending colon in the form of the capital letter J. Cæcum to the right of ascending colon, parallel to it, and pointing to the liver. The appendix, gangrenous, lay in the sulcus formed by the cæcum and ascending colon. Small intestine lay behind these structures, whether duodenum or a coil of the ileum, I was unable to determine. The gut was so thickened and infiltrated that it was impossible to treat the remnant of appendix other than by the introduction of cigarette drains to the bottom of the abscess cavity. A foul discharge continued for several days, and it was feared that a fecal fistula would develop. Fortunately this did not occur. Pathological report on the small piece of appendix we were able to remove was gangrenous appendicitis. An X-ray of the colon was obtained subsequent to his recovery (Fig. 1).

A detailed description of the retrocæcal cases is not necessary, except to emphasize the difficulty in early diagnosis, for the reasons above stated.

Dr. Charles H. Mayo (*Medical Record*, March 2, 1912) reports five cases of ascending colon on the left side, or approximating the median line. Three were operated upon for left-sided appendicitis. Two with acute abscess.

From this brief review it will be seen that this condition of abnormally placed appendix, while not common, does confront us in a certain small percentage of cases.

The correct interpretation of these various positions of the appendix is only possible, by a study of the embryology of this part of the intestinal tract. Each of these positions of the intestine, which we think of as abnormal, has some stage of embryological development, or some prototype in comparative vertebrate anatomy, as its explanation.

While it is impossible to trace each step of development in human embryology, yet by the aid of comparative anatomy, we are able to follow the picture with great surety.

The earliest indication of the alimentary tract is that of a straight tube attached to the axial mesoderm by a dorsal

# PARTIAL OCCLUSION OF THE THORACIC AND ABDOMINAL AORTAS BY BANDS OF FRESH AORTA AND OF FASCIA LATA.\*

BY WILLIAM S. HALSTED, M.D.,  
OF BALTIMORE, MARYLAND.

LIGATION of the human abdominal aorta has been made nineteen or twenty times and always with fatal result.

Dubois, Assalini, Bujalsky, Cooper, Keen and perhaps others attempted to occlude the abdominal aorta gradually by means of cleverly devised instruments which, carrying snares of silk, metal or catgut, might be tightened or loosened at will. The instruments traversed the abdominal wall and hence infection was a complication common to all of the methods and defeated the plans of the operators.

In 1904, assisted by Dr. W. F. Sowers, I began a series of experiments on dogs in the hope of finding a safe method of occluding the aorta and curing aortic aneurism. Bands of silver and aluminum curled about the aorta by an instrument constructed for this purpose were rolled tighter by the fingers until the desired degree of occlusion of this vessel was obtained. The abdominal wounds were closed with the expectation that they would have to be reopened one or more times for the purpose of progressively occluding the lumen of the artery. But in the course of our experiments we had opportunities to make trial in the human subject of partially occluding bands on other arteries (innominate, subclavian, carotid, femoral, popliteal) whose blood streams in some instances it seemed unsafe to cut off suddenly and completely, and found that occlusion of an artery, carried to the point of obliterating the pulse, usually sufficed to cure the aneurism, possibly quite as surely as might have been expected of total occlusion. Hence, tentatively, I abandoned the idea of pro-

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\* Read before the American Surgical Association, May 7, 1913.

I was pleased to find that the cuff which had been used in this experiment was apparently organized and had not stretched to any appreciable extent. Above the cuff the aortic pulse was forcible, but below the constriction it was very feeble, though countable and accompanied by a thrill.

The other dog operated upon at the same time and in the same manner, except that a spiral band of aorta instead of a cuff had been employed, died (cause of death unascertained) about three weeks after the operation. In this instance the aorta had been almost completely occluded by the spiral aortic strip. The welt-like band had not stretched and seemed to be organized. The aorta, on being split longitudinally, was seen to be greatly wrinkled and almost occluded at the site of the band. Sections of the specimens indicated that the elastic coats of the bands as well as of the included artery were intact.<sup>1</sup> During the present winter I have made about twenty-five similar experiments with encouraging results. We have learned, however, that whereas the spiral bands seem to be perfectly safe there is danger in the employment of the cuffs. In two instances of twelve or more experiments, one of the mattress sutures taken to hold the flaps of the cuffs together cut part way through the cuffs and thus, being brought in contact with the aortic wall, wore a minute hole in the vessel through which the animal bled to death. Such an accident can hardly happen with the employment of the spiral strip, for not only is the strain on the stitches very slight when this form of band is used, but even if it were so great that a thread might cut through the spiral at any point, it could hardly be brought to bear upon the aorta in such way as to wear into its wall.

To each end of the band of fresh tissue a narrow tape is sewed to facilitate the manipulation of the transplant, which is wound twice about the aorta. When one or two stitches

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<sup>1</sup> These observations were briefly reported a year ago in a footnote to an article entitled "The Effect of Ligation of the Common Iliac Artery on the Circulation and Function of the Lower Extremity." The *Johns Hopkins Hospital Bulletin*, July, 1912, p. 217.

mesenteric artery. The cæcum and the ascending colon under the pull of the small intestine, has undergone a rotation on its long axis of a hundred and eighty degrees. This is well shown by tracing the muscular longitudinal bands of the ascending colon into the transverse colon.

Take for example a piece of rubber tubing to represent the ascending and transverse colon. Place upon it three lines to represent the longitudinal bands of the intestine. Let them be marked distinctively, so that, in whatever way you twist the tube, they may be distinguished, one from another. The attached, posterior, or mesenteric border of the embryonic gut is the site of the "posterior band."

Hold the portion of the tube, which we have denominated transverse colon, in the anatomical position, the posterior longitudinal band cephalad; the so-called "anterior band" will lie ventrad, and the "inner band" will lie dorsad.

Bend the tube at what would be the hepatic angle, and twist that portion representing the ascending colon on its long axis, from left to right through one hundred and eighty degrees. It will be found that the longitudinal bands will assume the position we call normal in the ascending portion of the colon. The "anterior band" external, the "inner band" anterior and internal, the "posterior band" posterior and internal. The right leaf of the ascending colon unites with the parietal peritoneum on the right side, and the left leaf of the descending colon unites with the parietal peritoneum on the left side of the abdomen. In this way the normal adult type of peritoneal arrangement is brought about.

The accompanying illustrations (Figs. 2-10), kindly loaned me by Professor George S. Huntington, from his volume on The Anatomy of the Peritoneum, will better illustrate the points in development.

From a review of these figures we see we can derive all the forms of abnormally placed appendix. Arrest of development may halt the cæcum and ascending colon at any point in its progression from left to right. Failure of the intestine to rotate on its duodenocolic isthmus leaves the colon to the left

\* Read before the American Surgical Association, May 7, 1913.

The trunk of the pulmonary artery is easily accessible; On a longitudinal incision of the pericardium to the outside of the plexus made up of the left phrenic nerve and vessels which run right on the surface of the sac, the first vessel encountered is the pulmonary artery. Its direction is obliquely upward and backward toward the left. The forefinger or a large curved sound introduced right below it in a finger or a large curved sound introduced right below it in a patient, enters the transverse sinus of the pericardium (see Fig. 1) and passes around the artery and the ascending aorta which latter lies on the right side of the pulmonary artery. Both vessels are intimately connected by means of connective tissue and are surrounded by the same layer of the visceral pericardium; it is impossible to separate them. There is no defined sheath of the pulmonary vessel, a thin layer of subsuperficial divides into the right and left branches. The right, longer than the left, turns downward and backward around the ascending aorta, passes the superior vena cava, and divides into two branches, an upper and a lower one (Fig. 1), at a level with and right above the right bronchus, before it enters the hills of the lung. Further on, these two again divide, the pulmonary artery branch always running "to the north," of the respective bronchus. This is an important centre of the lungs. The main trunk of the pulmonary artery lies almost entirely within the pericardium and is about five centimetres (two inches) long. At the concave border of the aortic arch the vessel divides into the right and left branches. The right, within the ascending aorta, passes the superior vena cava, and divides into two branches, an upper and a lower one (Fig. 1), at a level with and right above the right bronchus, before it enters the lungs. Further on, these two again divide, the pulmonary artery branch always running "to the north," of the respective bronchus. This is an important centre of the lungs. The main trunk of the pulmonary artery lies almost entirely within the pericardium and is about five centimetres (two inches) long. At the concave border of the aortic arch the vessel divides into the right and left branches. The right, longer than the left, turns downward and backward around the ascending aorta, passes the superior vena cava, and divides into two branches, an upper and a lower one (Fig. 1), at a level with and right above the right bronchus, before it enters the lungs. Further on, these two again divide, the pulmonary artery branch always running "to the north," of the respective bronchus. This is an important centre of the lungs. The main trunk of the pulmonary artery lies almost entirely within the pericardium and is about five centimetres (two inches) long. At the concave border of the aortic arch the vessel divides into the right and left branches. The right, longer than the left, turns downward and backward around the ascending aorta, passes the superior vena cava, and divides into two branches, an upper and a lower one (Fig. 1), at a level with and right above the right bronchus, before it enters the lungs. Further on, these two again divide, the pulmonary artery branch always running "to the north," of the respective bronchus. This is an important centre of the lungs. The main trunk of the pulmonary artery lies almost entirely within the pericardium and is about five centimetres (two inches) long. At the concave border of the aortic arch the vessel divides into the right and left branches. The right, longer than the left, turns downward and backward around the ascending aorta, passes the superior vena cava, and divides into two branches, an upper and a lower one (Fig. 1), at a level with and right above the right bronchus, before it enters the lungs. Further on, these two again divide, the pulmonary artery branch always running "to the north," of the respective bronchus. This is an important centre of the lungs.

ANTONY

Attending Surgeon to the German and Post-Graduate Hospitals.

OF NEW YORK.

BY WILLY MEYER, M.D.,

## THE SURGERY OF THE PULMONARY ARTERY.\*

Fig. 1.

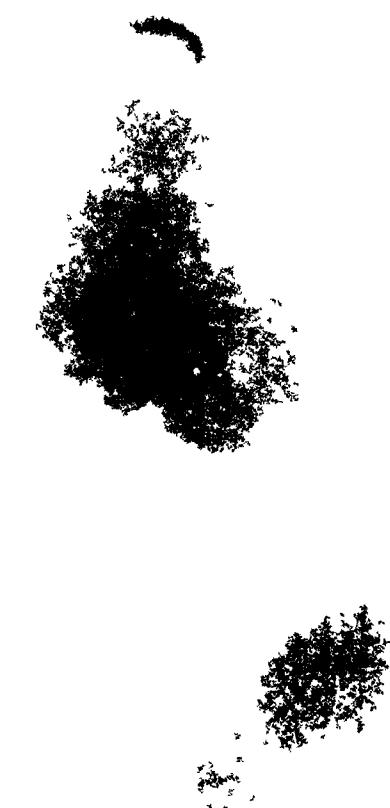


Fig. 1.

cised at the level of the third rib and the wound lengthened in an upward and backward direction until the entire upper half of the pericardium is divided; the lower half remains closed and the heart itself in its normal position. All this can be well done within five minutes. A rubber tube with the help of Trendelenburg's sound (Figs. 3 and 4, *a*) is then quickly drawn through the transverse sinus of the pericardium around the ascending aorta and pulmonary artery, held, and pulled upon for compression by an assistant, immediately before the surgeon punctures the vessel with a sharp-pointed bistoury. The presenting thin layer of fat with the visceral pericardium having been torn, if time permits, with care between two anatomical forceps, the wound in the arterial wall is lengthened for about one centimetre ( $\frac{1}{2}$  inch). Without a moment's loss of time a specially curved, blunt forceps (Fig. 4, *b*) is introduced, first into the main artery, then into its branches, the thrombus or thrombi grasped and extracted (Fig. 5). Only 45 seconds are at the disposal of the surgeon for this, the principal part of the operation, since observations have shown that the interruption of the circulation in this part of the body is not tolerated longer. Now the lips of the vessel wound are lifted up by special forceps (Figs. 4, *c* and 6 *a*), and temporarily closed by a clamp (Figs. 4, *d* and 5), after which the assistant interrupts the elastic compression. Circulation therewith having been re-established, the heart immediately begins to work, often violently, if the patient had not died before. If needs be, the manœuvre of compression, reopening of the arterial wound and introduction of forceps can be repeated. Closure of the wound in the pulmonary artery by interrupted silk sutures is rendered easier by pulling at intervals on the elastic tube, which will cut the artery at rest for a few seconds. Closure of the wound of the pericardium and chest wound according to ordinary surgical rules.

Trendelenburg's experience in animal experiments was obtained on calves, without the use of differential pressure; dogs were not considered suitable subjects. A piece of lung,

Scheme of human embryonic intestine after differentiation of large and small intestine.

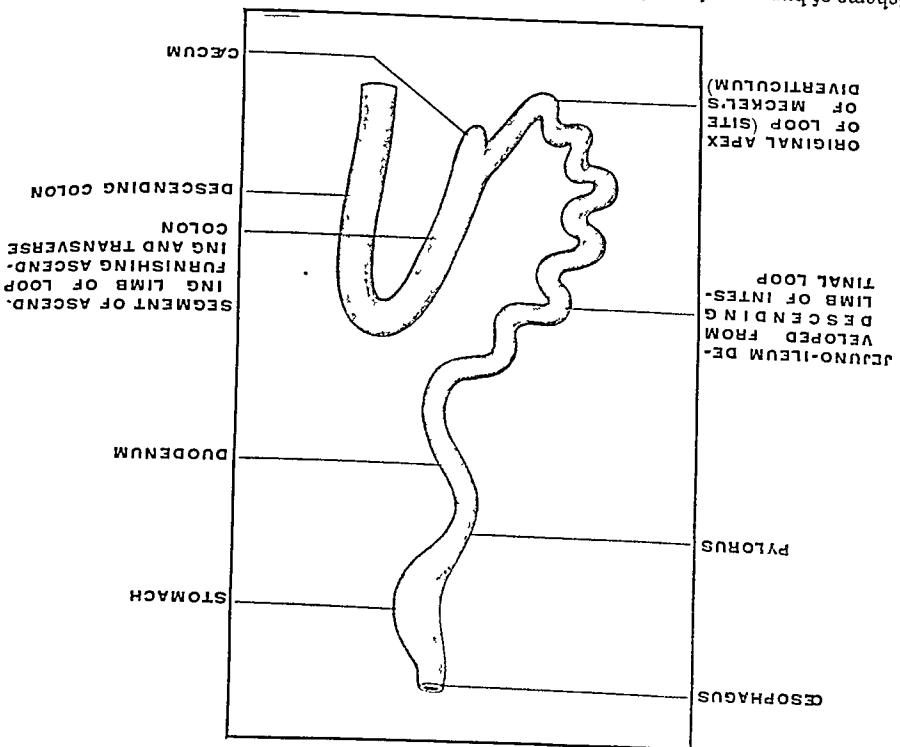


FIG. 2.

Trendelenburg's operation for the extraction of pulmonary emboli. — Incision along side left border of sternum, and over median portion of second rib; the latter with certi- large resected; third costal cartilages divided. Triangular flaps turned back. Pleura incised; pericardium opened. Trends pulmonary artery plus ascending aorta forward. Elastie tube screwed on; ready to be drawn around vessels.

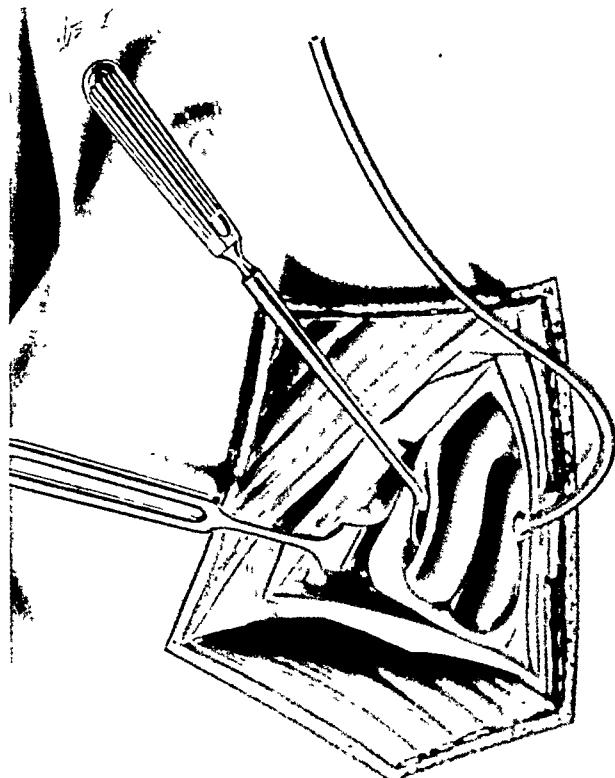


FIG. 3.

Abdominal viscera of the little ant-eater, seen from the left, to the right



FIG. 5

Fig. 6a.—Forceps introduced to facilitate lifting and proper clamping of artery.  
Longitudinal wound in pulmonary artery clamped laterally, permitting blood circu-  
lation alongside during the act of placing the interrupted sutures.

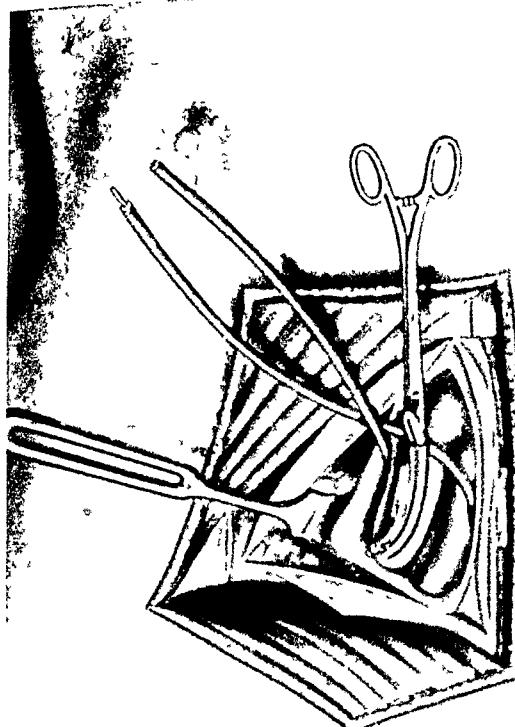


Fig. 6.

I. THE EXCISION OF BOTH LOBES OF THE THYROID GLAND FOR THE CURE OF GRAVES'S DISEASE. II. THE PRELIMINARY LIGATION OF THE THYROID ARTERIES AND OF THE INFERIOR IN PREFERENCE TO THE SUPERIOR ARTERY.\*

BY WILLIAM S. HALSTED, M.D.,  
OF BALTIMORE, MARYLAND.

I. In 39 cases of Graves's disease for the cure of the hyperthyroidism it has been necessary to excise, at two or more operations, the greater portion of both lobes of the thyroid gland. Several of these patients, operated upon as long ago as 1902 and 1903, are still under observation and in quite perfect health.

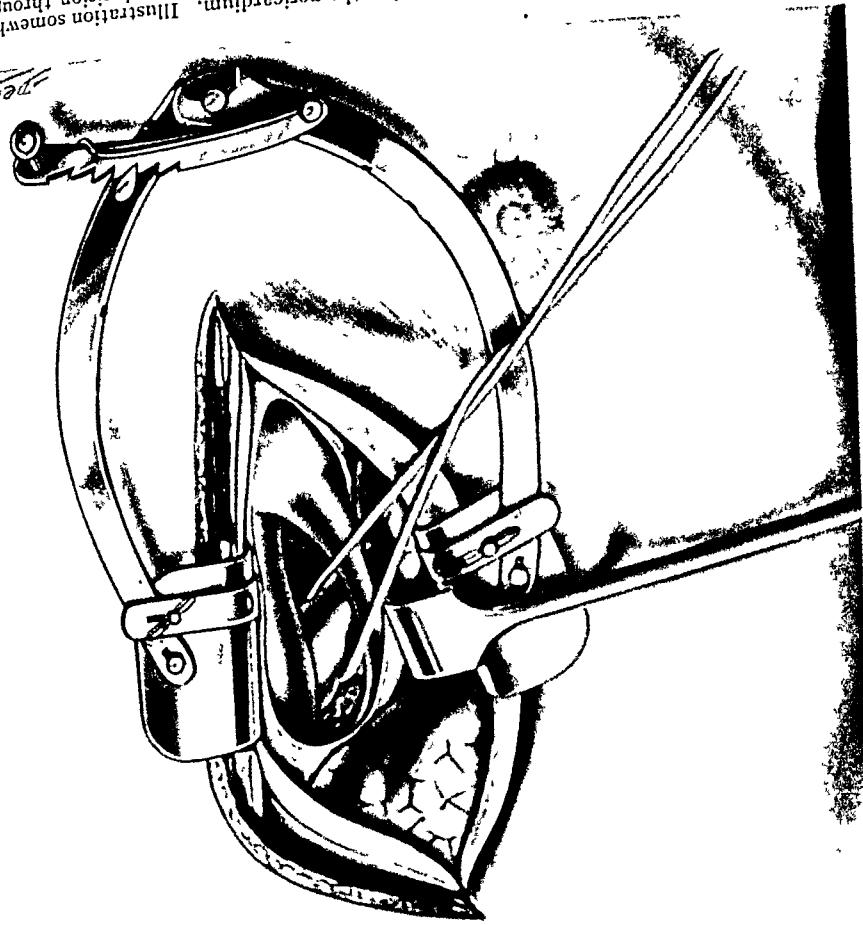
In all of these cases the second lobe was removed because excision of the first had been followed by insufficient improvement. In several instances in which the ligation of three arteries plus the excision of one lobe had been attended with almost negative results, relief from all symptoms followed immediately upon the removal of the remaining lobe; hence the advisability, repeatedly emphasized by Dr. Halsted in his publications, of operating upon the first lobe in such manner that the second may be excised without danger of tetany. A small slice of each thyroid lobe is left in order to protect the circulation of the parathyroid glands. The operation is performed in an absolutely bloodless manner, all of the blood-vessels supplying the lobe being clamped (but not ligated until after the lobe has been cut away) at a safe distance from the parathyroids.

No muscles are divided in the course of the operation except a few of the fibres (usually the posterior fibres) of the sternothyroid. Haemostasis is attended to with scrupu-

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\* Read before the American Surgical Association, May 7, 1913.

Ligation of right pulmonary artery after operation, with help of a curved combination suture through first rib and hip bone supported by losacks. Body turned on left side (not shown in picture), the right costal cartilages and first intercostal division plus resection of second rib removed. Bodily movement ascended with a built book toward the median horizontal line and across into view. By retentive suture the right pulmonar artery, running horizontally in the depth, the superior vein eva clearly visible in the large range of operation.



• 8 •

patients are not sufficiently benefited by the removal of the first lobe.

In some the second operation is done promptly (two to four weeks after the first) and in these the interval is so short and the improvement from the first operation so slight that great change in the histological picture is not to be expected.

And when the interval has been long the second operation may have been delayed by the patient until she is in worse condition than originally, and the hyperplasia has become correspondingly advanced.

Sometimes the second lobe has been removed several years after the first and when the patient was still vastly better than before the first lobectomy. In these patients the improvement in the histological picture may be considerable.

II. It happens that in no instance have we found that the preliminary ligation of two, three or even of the four arteries sufficed to cure the patient seriously ill with Graves's disease, although we have observed that considerable improvement, for a short time at least, may follow the ligation of even a single artery. Ligation in our clinic has been practised only in the most serious cases and always with a view to improving the patient's condition to such an extent that lobectomy might safely be performed and to testing her resistance to operation, hence I have endeavored to reduce the preliminary procedure to the simplest possible terms, ligating each artery through a space just large enough to admit of exposure of the vessel—a space too small, as a rule, to admit more than one finger. For the past two years or more I have tied the inferior in preference to the superior arteries and for the following reasons:

i. The cosmetic effect is better. The incisions for ligation of the superior vessels have to be made at a higher level than the Kocher collar incision, which is invariably employed for the lobectomy, and there results, in consequence, a well-like band of skin between the two horizontal cuts which is a pronounced disfigurement.

In tying the inferior vessels the incisions correspond, as I



in close proximity to the parathyroids and through large incisions might result quite differently. In three instances, in which I have ligated the four arteries in two or more acts and subsequently removed the greater part of both lobes in the manner about to be described, transient symptoms of tetany manifested themselves.

The inferior thyroid artery is ligated as follows: A transverse cut, from 4 to 4.5 cm. in length, is made over the tendon of the omohyoid muscle precisely in the line of the Kocher collar incision as contemplated for the subsequent lobectomy. The fibres of the sternomastoid muscle are separated in line of the common carotid artery at the level of the omohyoid tendon. The thyroid lobe is exposed behind the posterior fibres of the sternothyroid muscle and drawn inward by a retractor designed for this purpose. The common carotid is retracted outward by a similar though somewhat shorter instrument and the layers of fascia covering the inferior thyroid artery are divided at the level of the omohyoid tendon. The dissection is then carried out solely with the two long, delicate, blunt dissectors, for the artery is sometimes at a great depth (greatest when the Graves's disease has been engrafted on a colloid goitre), and the space is only large enough, as a rule, to admit one finger between the deeply concave retractors. A special aneurism needle is used for carrying the fine silk ligatures around the artery. The wound is, of course, not drained. The operation, if performed precisely in this manner, is not difficult. Only once have we failed to find the artery in its usual situation; this was about five years ago.

nical difficulties that seemed at first glance to block the way. The steps of his operation are clearly defined.<sup>2</sup>

If it could be shown that patients can entirely recover after the operation, surgeons would, no doubt, be less inclined to temporize, but would operate as soon as the diagnosis has been made.

All operators speak of the enormous distention of the right ventricle of the heart after the onset of the catastrophe, which, as a matter of necessity, increases from minute to minute.

Trendelenburg's assistants, Laewen and Sievers, on the basis of experimental work, recommend artificial respiration with oxygen during the operation, and injections of adrenalin into the left ventricle, immediately after the elastic compression of the vessels has ceased.<sup>3</sup> They also found that whereas aorta and pulmonary artery can be compressed for 45 seconds only, the two venæ cavæ may be compressed for six to eight minutes without endangering life, a point which had already been emphasized by Sauerbruch previously. The explanation is that in the former case the distention of the right heart is added to the interruption of the circulation. On basis of these findings, Jeger<sup>4</sup> proposes compressing the two big veins, when carrying out Trendelenburg's operation, rather than the two big arteries. In his experiments along these lines he found that he could do the incision and closure of the pulmonary artery leisurely. The incision of the pulmonary artery brought immediate relief to the distended right heart. He thinks it might be still better to commence work on the heart with puncture of the right ventricle.

According to Trendelenburg, coagulation of the blood and recurrence of the embolic accident can be avoided by injections of hirudin.

His assistants, Rimann and Wolf, investigated this question.<sup>5</sup> They found that one milligramme hirudin prevents the

<sup>2</sup> See Trendelenburg: Centralbl. f. Chirurgie, 1907, pg. 1302; ibid., 1908, pg. 92, and No. 35, Beilage, pg. 3; Deutsche med. Wochenschrift, 1908, No. 27; R. Sievers: Deutsche Zeitschrift für Chir., vol. 93, pg. 282.

<sup>3</sup> Deutsche Zeitschr. f. Chirurgie, 1910, vol. 105, pg. 174.

<sup>4</sup> Die Chirurgie der Blutgefasse u. des Herzens, 1913, pg. 243.

<sup>5</sup> Deutsche Zeitschr. f. Chir., vol. 97, pg. 177.

gressive closure of the aorta determining, instead, to obliterate the lumen of this vessel, in the attempt to cure its aneurism, to an extent which we had found quite safe in the dog.

I have applied an aluminum band to the human aorta four times; twice in one subject and twice with promising results so far as the cure of the aneurism is concerned. But the experimental work on animals had led me to expect that ultimately the metal bands must cut through the artery because in cases observed for seven months or less the wall of the aorta had become atrophied to the thinness of paper and there was no adhesion between the infolded, attenuated surfaces. That my fears were well founded was proved by an experience in Europe, about eighteen months ago. The patient was an aged woman with dilated and badly functioning heart. The large aortic aneurism was well located for the placing of a band which was applied just below the renal vessels. Within a few days the aneurism, which before operation was distinctly visible from the seats of the operating amphitheatre, was barely discernible at the bedside, and at the end of six weeks had disappeared so completely that the patient was discharged apparently cured. But, walking out of the door of the hospital she was seized with a pain and returned to her bed. The following morning she died from hemorrhage. The aorta had ruptured at the site of the band, but the aneurism was found to be nearly cured.

Stimulated by the result in this case to further experimentation it occurred to me to test the behavior of cuffs and spiral strips of the fresh aorta of one dog when wound about the aorta of another. So on April 29, 1912, I operated upon two dogs, partially occluding the aorta of one of them with a spiral aortic band and of the other with a cuff cut from the same vessel. Strips of aorta were employed rather than of fascia lata, for example, because I hoped that the elastic tissue, in case it did not endure might, at least, serve its purpose for a time sufficient to cure an aneurism.

At the end of two months one of the dogs was killed and

Zurich. He calls attention to the fact that the diagnosis of pulmonary embolism may be difficult because a suddenly occurring internal hemorrhage, also myodegeneration of the heart can produce like symptoms.

Regarding diagnosis he considers, next to the clearly demonstrable enlargement of the right heart, the accentuation of the second pulmonary sound of importance.

He distinguishes three classes of pulmonary embolism:

1. The one causing immediate exitus, which evidently is due to shock, as not infrequently only a partial thrombosis of the artery may be found at autopsy.

2. The one causing death within a few minutes. Here thrombosis is perfect, separating pulmonary and greater circulation. The right heart becomes quickly overdistended.

3. The one of protracted course, which is most frequently observed. Here one of the main branches of the artery and a subdivision become suddenly clogged; only gradually total obstruction sets in.

As a matter of fact only the third category will furnish cases with indication for operation, and the task of establishing this indication is rendered difficult on account of the experience that some of these patients get better under conservative treatment. He considers operation imperative if medical treatment fails to bring improvement.

Four times this operation was performed at the Zurich clinic, but the patients could not be saved.

How much less dangerous the use of differential pressure has rendered Trendelenburg's operation in experimental surgery and operations on the heart in general, is shown by the results of operations upon dogs—animals which were not considered as suitable for this purpose. Of three dogs operated upon by myself with the assistance of Dr. Martin Rehling, adjunct attending surgeon at the German Hospital, two recovered, although the instruments used in human beings had to be employed (by far too large a set for the smaller dimensions of the dog).<sup>6</sup> The third dog succumbed to the

<sup>6</sup> One of these dogs was presented before the New York Surgical Society, May 8, 1912.



monary tuberculosis. They gradually but continually remain on the increase. In most instances the exceedingly foul odor and taste of the sputum torment the patients and their families beyond expression; the frequency of the expectoration interferes with their night's rest.

With the advent of thoracic surgery, bronchiectasis has, therefore, clearly become a surgical disease, which after operation has to be considered a disease of the borderland.

Inasmuch as this article deals merely with the surgical aspects of the pathologic condition and more particularly with the surgery of the pulmonary artery, in respect of them only the operative procedures for bronchiectasis will be mentioned.

*A. Artificial pneumothorax by insufflation of nitrogen into the pleural cavity.*

This is a recommendable treatment where there are no adhesions and where the pulmonary parenchyma is the seat of the disease. But in bronchiectasis, in which the bronchial tree is the affected part, no lasting result can be expected from outside compression of the lung by gas. Vollard reports a case of bronchiectasis, treated with artificial pneumothorax for two years and a half (*Muench. med. Wochenschr.*, 1912, No. 32); the sputum was temporarily reduced; but upon discontinuance of the treatment the sputum promptly returned to its original quantity. More lasting results may be obtained by collapse of the lung by means of thoracoplasty.

*B. Incision of the bronchiectatic lung abscess (pneumotomy).*

Cures have been reported after this operation. They are exceptions, however. Usually the expectoration is for a time considerably reduced thereby, since a part of the bronchiectatic cavities drain through the chest wound. However, with advance in cicatrization, the sputum increases again. When cures have been actually obtained they have usually not been lasting, relapses having been frequently observed.

*C. Partial thoracoplasty combined with pneumolysis, and transposition upward of the diseased lobe of the lung by suture, tamponade of the pleural cavity between base of lung*

anatomical point. The left (shorter) main branch of the pulmonary artery first continues in the original direction of the parent trunk, but soon turns downward in front of the left bronchus and the descending aorta toward the hilus of the left lung. There are many varieties in the subdivision of the pulmonary vessels.<sup>1</sup>

#### OPERATIONS.

##### *I. Removal of Pulmonary Emboli. Trendelenburg.*

In man the best method known at present of obtaining access to the main trunk of the vessel is that devised by Trendelenburg. In experimental surgery upon dogs, an intercostal incision in the third or fourth space with use of rib-spreader suffices for proper access.

Trendelenburg's operation, as finally worked out, is briefly as follows: A horizontal incision about ten centimetres long is made upon the left second rib, beginning at the left border of the sternum and dividing skin, fascia and fibres of the pectoralis major muscle. This is crossed by a perpendicular cut which starts right below the sternoclavicular articulation and passes the cartilage of the third rib about one inch outside of the sternal border; it avoids the left internal mammary artery (Fig. 2, a). The two triangular flaps with underlying muscle are turned back (Fig. 3), isolation and division of the second rib outwardly. In raising and twisting its sternal portion the cartilage breaks; this portion of the rib is removed; division of the third cartilage in a perpendicular line. Usually by this time the pleura has been opened and the use of differential pressure is welcome, provided time and a sufficient number of assistants are at the surgeon's disposal. If the pleura had not been opened a  $\leftarrow$  incision through it, corresponding to the outer one, has to be made (see Fig. 3). The lung is allowed to collapse somewhat and thereby the pericardium exposed. Upon it the phrenic nerve with phrenic vessels become visible. Inwardly of the same the pericardium is in-

<sup>1</sup> Cf. E. D. Schumacher: Verhandl. d. Deutschen Gesellschaft fuer Chirurgie, 1911, pg. 246; and v. Langenbeck's Archiv., vol. 95, pg. 536.

to be awake, asks for general anaesthesia; granted, very superficial. Lung widely adherent, freed up to apex incl. (total pneumolysis); interlobar space closed by tight adhesions, cannot be entered; therefore, ligation of pulmonary branch above and at base of bronchus with silk. Closure of thorax. Patient returned to ward; primary union; out of bed four days later; quantity of sputum diminished; later slowly increasing. Soon goes to country; able to work.

January 17, 1913, increased weight; expectoration about 180 c.c. in 24 hours.

March 13, 1913, thoracoplasty, under regional novocain anaesthesia; Schede's incision, lower half; sixth to tenth ribs inclusive, resected.

April 1, inhalation of superheated air begun by means of electric hot-air douche; brings little improvement. In near future second to fifth ribs to be attacked by columnar resection in paravertebral and mammillary lines (Wilms).<sup>10</sup> On the whole, patient improved, but so far not cured.

CASE II.—F. N., male, seventeen years of age; expectorated for last five years following pneumonia. Left lower lobe involved; typical sputum; no T. B.; pronounced scoliosis. Nine months in sanatorium, without improvement.<sup>11</sup>

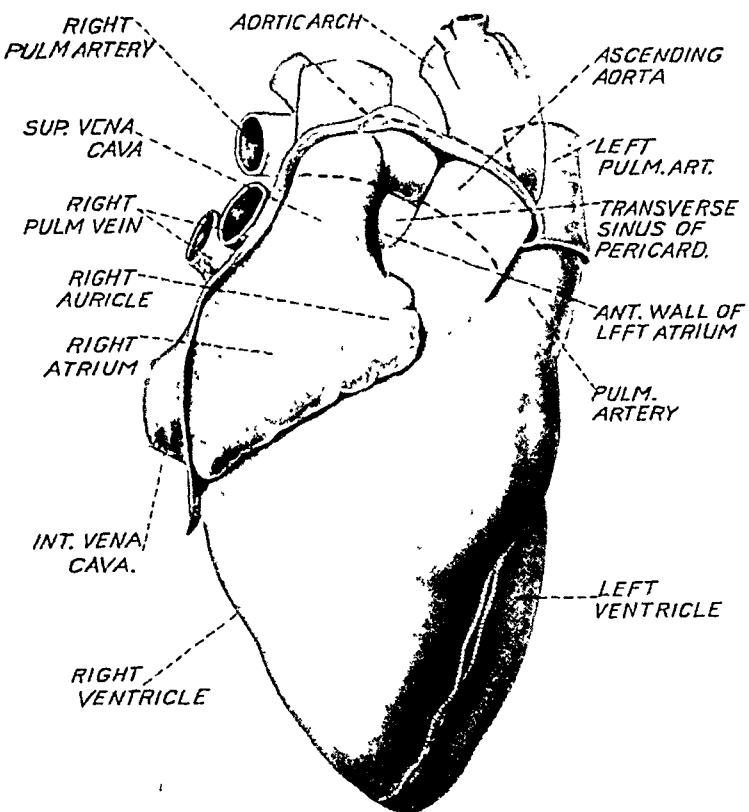
*Operation* (May 12, 1912).—Negative chamber; regional anaesthesia, as before; expectorates freely during progress of operation; superficial general anaesthesia, which patient asked for, induced. Intercostal incision in fifth space. Lung adhesions not loosened; artery of lower left lobe identified and ligated (chromicised gut). Portions of lower lobe atelectatic; closure without drainage; soon rise of temperature; middle of wound re-opened; exit of turbid serosanguinous fluid; fever gradually dropped; healed slowly. Returned to sanatorium in July, where he still is; has gained 16 pounds in weight; daily amount of sputum 120 c.c.<sup>12</sup>

<sup>10</sup> These operations were carried out on May 15, posteriorly, and May 31, anteriorly, under regional anaesthesia. Primary union followed both operations. Patient is now ready to leave hospital (June 7).

<sup>11</sup> Referred through courtesy of Dr. Rathbun, the present physician-in-chief at the Otisville Sanatorium.

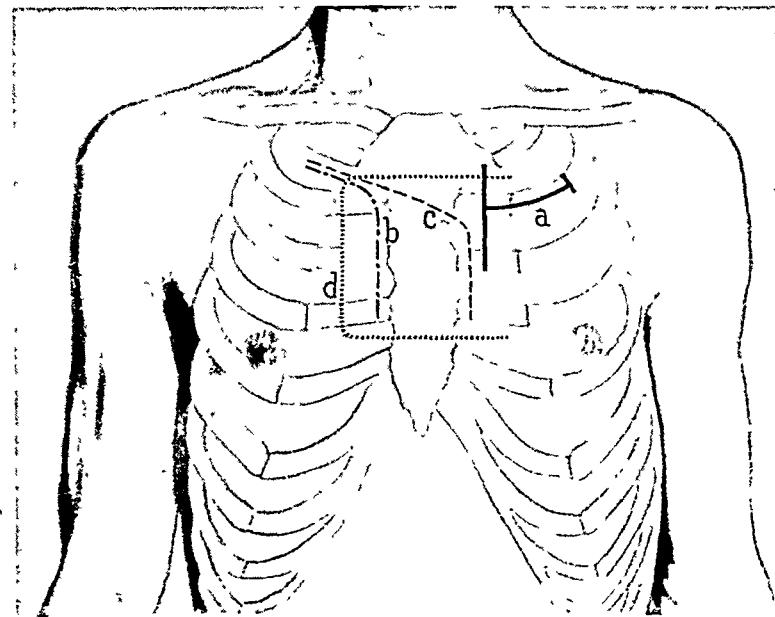
<sup>12</sup> May 15. Thoracoplasty under regional anaesthesia. Ribs run almost perpendicularly upward. Large Schede incision required. Resection of tenth to sixth ribs inclusive; doing nicely; will soon return to the country sanatorium.

FIG. 1.



Heart seen from the right side. Note the upper entrance into the transverse sinus of the pericardium (which appears larger than normal, due to the process of hardening the specimen), also the transverse course of the right pulmonary artery behind ascending aorta and superior vena cava as well as its division at the right border of the latter vessel. (Taken from the book on "Topographic-Anatomy" by Oscar Schultze.)

FIG. 2.



Incisions for exposing the heart and large blood-vessels. **a**, for Trendelenburg's operation. **b** and **c**, originally considered useful for reaching the right pulmonary artery for ligation between ascending aorta and superior vena cava. Experiments on the cadaver have shown both to be inadequate. **d**, trap-door flap, which appears recommendable. It involves resection of second to fourth right costal cartilage with a piece of the adjacent ribs, ligation of the internal mammary plexus in second and fourth intercostal space on both sides, transverse division of the sternum at same levels, raising flap and turning it over to left of patient.

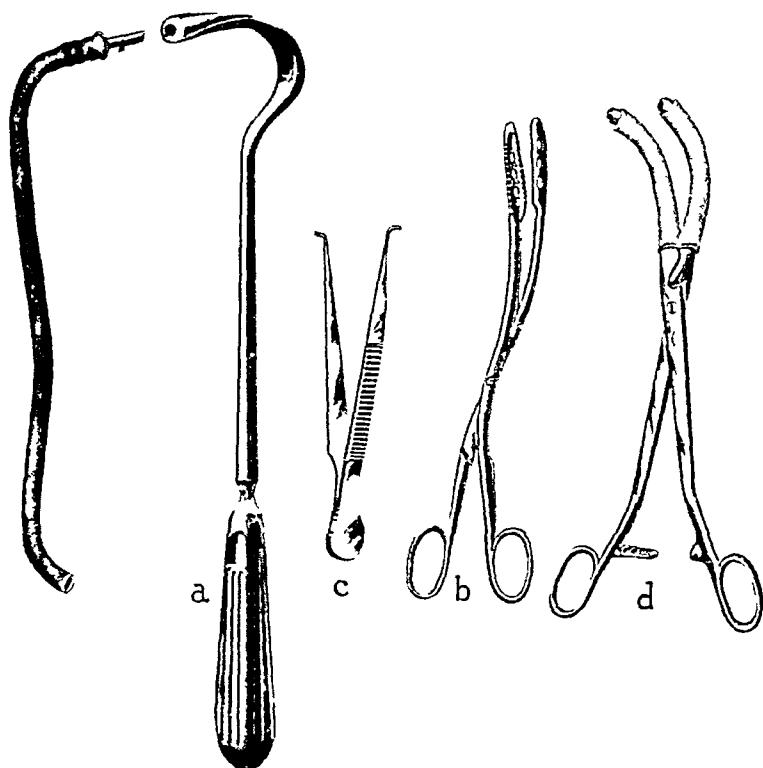
40-45 minutes each time; improvement continues; sputum reduced to 30 to 60 c.c. within 24 hours. Wounds closed; has gained in weight; sleeps all night. Thoracoplasty deferred for the present.

Regarding the technic of the operation, it must be stated that it is not as simple in the human being as it is in the dog. In the latter the pulmonary lobes are clearly divided; broad, pleuritic bands, if present, can be easily and safely cut and the bronchus with accompanying vessels exposed. In man the lobes of the lung often form a unit, with adhesions between them, the thicker the oftener attacks of pleurisy have been experienced. The interlobar space can be entered, but the bronchus with its vessels is not always reached without injury to the lung tissue; and when thoroughly exposed, the bronchus may be found covered by a few enlarged and inflamed lymph nodes, as in my Case III, which render isolation of the artery in the depth difficult, if not impossible. Besides, the variations in the division of the pulmonary artery, so thoroughly discussed by Schumacher in his lucid article (*l. c.*) leave the surgeon in doubt whether all the vessels that should be tied have been tied.

In view of these facts the desire to reach the right and left arteries before their division into branches, viz., nearer the heart, was but natural. This desire has become all the more intense, since two patients with bronchiectasis lately have come under treatment, in whom a strict localization of the trouble has thus far been impossible. One has been operated upon repeatedly for a bronchiectatic lung abscess on the right side before coming under my care; the other has an affection also of the right lung with a pulmonary hemorrhage off and on, and clinical signs of disease pointing to the right middle and upper lobe.

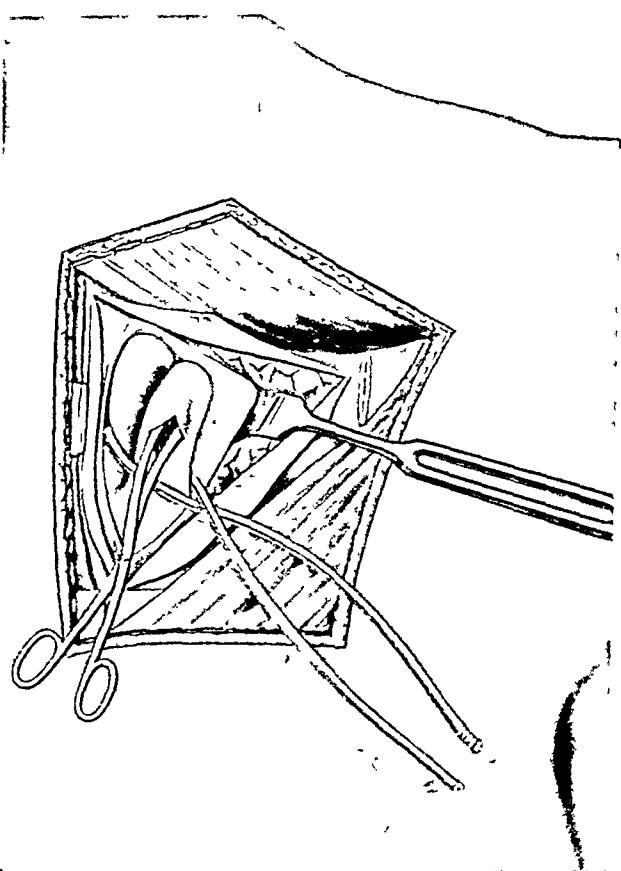
The experimental work which I have carried out with Dr. Rehling within the last few months, has in part been directed toward the solution of this question. Anatomical studies have shown that it will be best for the purpose in view to ligate the trunks themselves, of either of the two arteries. This is best done within the pericardium.

FIG. 4.



Instruments devised by Trendelenburg for his operation. *a*, large curved sound with handle, elastic tube detached; *b*, blunt pointed forceps for extraction of emboli; *c*, forceps with tips turned outward, which lift the borders of the incised wound of the pulmonary artery (see Fig. 6*a*); *d*, clamp with rubber covered branches, which closes the arterial wound (see Fig. 6).

FIG. 5.



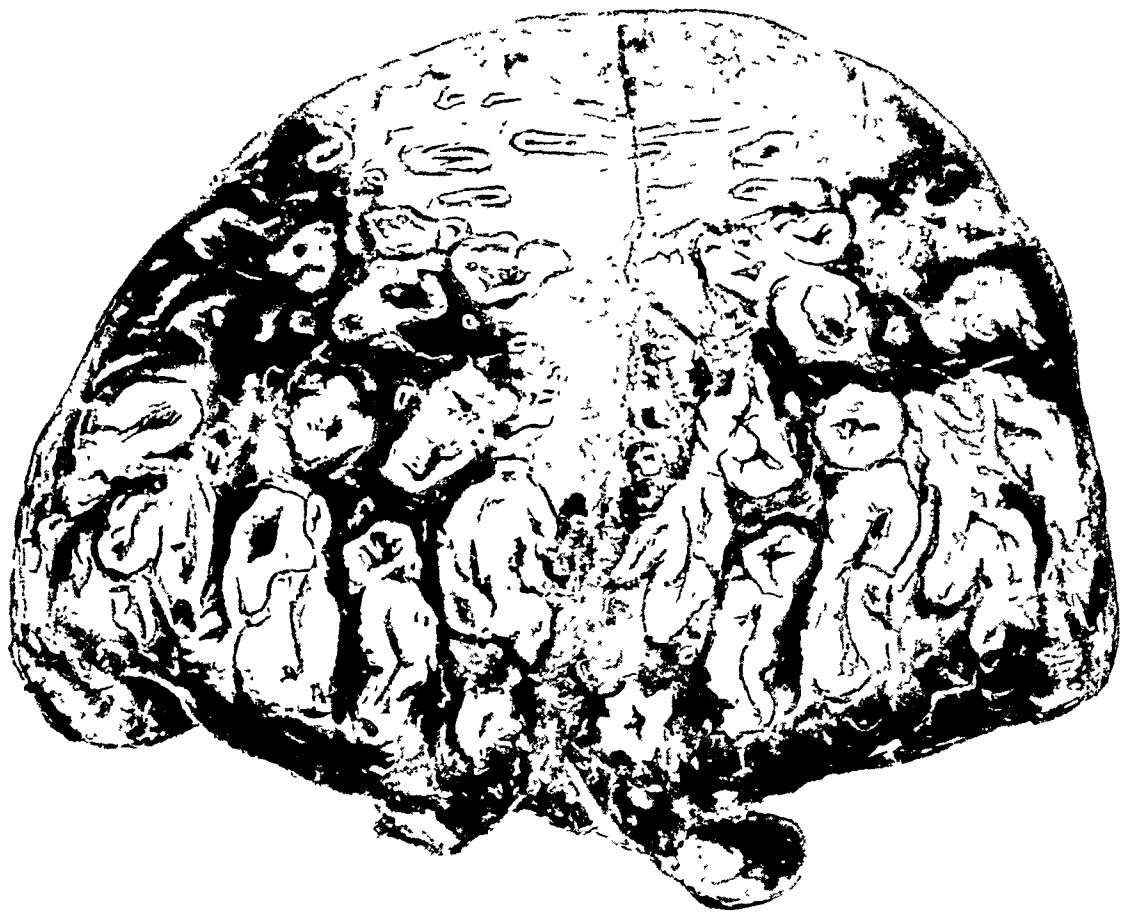
Elastic tube tightened by assistant, compressing both vessels (not shown in illustration). Pulmonary artery incised and forceps introduced for extraction of emboli.

unwise and unsafe to attempt here anything like what could be successfully done in the dog. A hemorrhage coming from the right pulmonary artery at this place would most likely mean the death of the patient on the table, except the quick temporary compression of superior and inferior vena cava would allow the operator to find the tear and close it by suture. We have, therefore, attempted to reach the right pulmonary artery on its further course. There are two ways open, one within the pericardium, the other outside of the same. The first place can be reached from the front, the latter from behind. Making it a postulatum that such an operation should not be too severe, the advance from behind has not been favored. We have, therefore, chosen in our experimental work to advance from the anterior side and ligate the artery within the pericardium in the following manner: Right intercostal incision in the fourth space; incision of pericardium (low down! to avoid hemorrhage), splitting of the pericardium upward until ascending aorta and superior vena cava are properly exposed. If these two vessels are then gently, without compressing them, separated with blunt retractors or the fingers, the right auricle being held down and its fibrillation kept under control with a small gauze mop, the transversely running right pulmonary artery becomes clearly visible in the depth (Fig. 1), and can be surrounded with a ligature (Fig. 8). At the present moment this kind of approach seems to us to represent the most favorable one. After some experience this ligation took us, from the beginning of the operation to the application of the dressing, half an hour; the dog recovered.<sup>13</sup>

A little further peripherally the right pulmonary artery divides into a superior and inferior branch which might be reached either from within the pericardium by pulling the main trunk, which is surrounded by a thread (Fig. 8), gently forward and toward the median line, retracting at the same

<sup>13</sup> Killed ten weeks after operation. Right pulmonary artery firmly closed by ligature. Upper and middle lobe tightly adherent to costal pleura, lower one still free. Pronounced increase of connective tissue in two upper lobes, less in lower (Report by Dr. Fred E. Sondern).

FIG. 7.

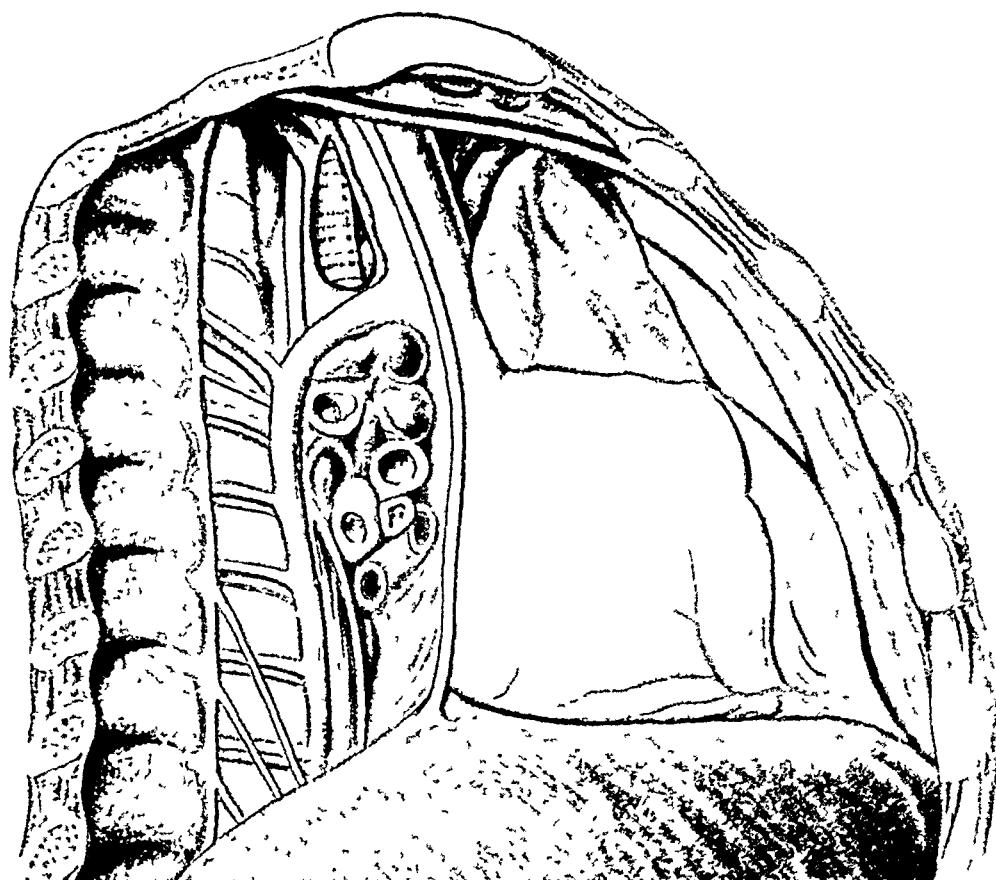


Bronchiectasis of inferior lobe of left lung, obtained by pneumectomy (personal collection). Actual size of specimen, divided by section cut. The pronounced distention and contortion of almost the entire bronchial tubes is well marked.

ferred to the right side will not give sufficient approach, not even in the cadaver. Longer incisions too (see Fig. 2, b and c) were found unsatisfactory. They may allow the operator to reach the right pulmonary artery in the upper part of the pericardium, but will never give him sufficient room in the living for satisfactory control of the deep-seated operating field in case of emergency. Only by means of a trap-door will the right heart and large blood-vessels within the pericardium become so thoroughly exposed that gentle handling and operating on them is rendered possible (see Fig. 2, d). The wall of the pulmonary artery and its branches is thin like that of a vein. In the frozen cadaver the Dechamp needle easily penetrates the vessel in the attempt of surrounding it. Dechamp's needle must have, for this work, a special length and special curve, also a very blunt point, in order to avoid hemorrhage. Perhaps it will be best for the operator to surround in the living patient the right pulmonary artery, which at this place is about the size of a man's thumb and flanked on either side with fat, with his right forefinger introduced from below upward. Extreme gentleness and careful, slow, and always blunt advance are absolute requirements. If men react as dogs, no shock will follow the tightening of the ligature. Whether a strong silk suture or a piece of tape or a fascia graft or even a small aluminum clamp should be made use of for closing the vessel only practical experience on the living can decide.

Two main questions arise with regard to this kind of ligation. One of them is: Is the disease sufficiently grave to warrant this intrapericardial ligation of the pulmonary vessels? The other is: Has the surgeon the right to cut off the flow of blood to the non-affected lobes of the lung? The first question can be answered decidedly in the affirmative: it is sufficiently grave. Experience must show whether dangerous reflexes might mar the result of the work in man; possibly an application of a 1 per cent. novocain solution, or even a stronger cocaine solution at and around the field of operation, inside the pericardium, may help to overcome this danger.

FIG. 9.



Situs mediastinalis in a child, right side view. Almost the entire right half of the thorax removed, and right lung cut off at its root. Note right phrenic nerve running parallel with superior vena cava, also rectangular entrance of vena azygos into this vessel. Incision through costal pleura above vena azygos added, through this window the trachea is seen. Below the vena azygos appears the bundle of divided bronchi with branches of right pulmonary artery and vein. A few lymphatic glands hug the right border of the large vein. By pulling the angle between vena azygos and superior vena cava downward and to the right and the trachea to the left with a blunt retractor, the place is reached where the right pulmonary artery divides into an upper and lower branch, still within the pericardium. The right uppermost turn of the pericardium must first be divided before the division of the vessel comes into view. (Taken from the book on "Topographic Anatomy" by Oscar Schultze.)

## SARCOMA OF THE CHEST WALL.\*

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OPERATIONS for tumor of the chest wall have always been among the comparative rarities of surgery.

Tumors of the chest wall, ribs, and sternum may be divided into primary tumors: fibroma, chondroma, sarcoma, and their combinations, and secondary tumors: sarcomata and carcinomata.

The primary tumors are of considerably greater interest. The diagnosis is ordinarily very simple, and reduces itself merely to the existence of the tumor. Pathologically they are chondromata, chondrosarcomata, osteosarcomata, or mixed tumors. The growth is always about the same. They appear almost always at about the middle of the thorax (Molimard). In thirty-nine cases in which the position was accurately indicated the tumor was located only three times on the first rib and six times on the second. They are more apt to be located on the sixth, seventh, and eighth ribs. They appear over the rib on either side, and usually involve the rib above and the rib below. In those thirty-nine cases, Molimard found one rib involved only nine times; two ribs, six times; three involved fifteen times; and seven ribs involved four times. While spreading on to the ribs, the tumor mass ordinarily does not attack the skin or the muscles.

For a long time usually the tumor expands first outside the chest, so that the intercostal vessels and nerves are not affected. Occasionally the growth of the tumor inward is attended by great pain due to involvement of the intercostal nerves. At first the nerves are lifted up, but finally both vessels and nerves are surrounded by the tumor. The tumor does not invade the lymphatics, but extends by direct growth

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\* Read before the American Surgical Association, May 7, 1913.

1 cm. thick and 15 cm. long, was removed from another animal at the slaughter house, under aseptic precautions, and introduced through the deep jugular vein into the circulation, everything being in readiness for the subsequent work. As soon as the symptoms of pulmonary embolism became manifest in the narcotized animal, access to the pulmonary artery was obtained in the manner described above, and the embolus extracted; it had become lodged in the left branch of the vessel. The calf, eight weeks old, recovered from the operation (December, 1907). The specimen of the heart and adjacent large blood-vessels was obtained 3 months later and demonstrated before the German Surgical Congress at Berlin, April, 1908.

Shortly before this presentation the operation was carried out by its author for the first time in the human being. The patient, 70 years old, died before the operation was finished. Since then it was done, according to a personal communication from Prof. Trendelenburg, dated January 31, 1912, twelve times in all, at the Leipzig clinic, without one permanent recovery. One patient lived for four days; another one, operated upon by Krueger, survived the operation, but died five days thereafter of pneumonia.

Prof. Trendelenburg writes: "All new and difficult problems require much work, favorable conditions and unfaltering confidence and perseverance. This holds good also in the operation for pulmonary embolism. Twelve times have we done it at the clinic, my assistants oftener than myself, and not once with success. And yet, I would continue trying. This much we have learned from our cases, that the diagnosis in all *surgical* cases is easy; invariably did we find the emboli."

Trendelenburg's operation is nicely adapted to the endeavors of present times. The ideal way of dealing with an acute arterial embolism is to cut down on the seat of the thrombus after proper localization, remove it and close the rent of the arterial wall by suture. Trendelenburg deals with the most common of embolic troubles which, if left alone, is frequently fatal. He has succeeded in overcoming the tech-

pressure. The mediastinum with its great blood-vessels and nerves is deflected to the opposite side,—less in man than in animals, it is true, but enough to be a cause of severe shock.

If these untoward conditions be overcome, there is the danger of infection in the pleural cavity, especially if, as was usually the case when drainage was employed, the lung was left collapsed at the end of the operation so that the closure of the cavity was impossible, and empyema,—bad enough in any case, but worse still when attacking a patient whose lymphatic spaces had been opened up by an extensive and mutilating operation,—was almost certain to follow.

Asepsis, modern instruments, and improved technic have, however, of late years gradually diminished the dangers of hemorrhage and infection; while during the last fifteen years, the improvements in our method of maintaining the expansion of the lung during the operation by positive pressure, Fell O'Dwyer apparatus, the positive and negative pressure cabinets of Sauerbruch, Brauer, and others, culminating in the almost ideal method of intratracheal anaesthesia, have removed the chief dangers of operative interference. The X-ray has enabled us to make an early diagnosis, and tells us whether we must be prepared for an extensive opening in the pleura or not; so that it is now our own fault if we do not deal with these cases better than did our predecessors.

In 1898, F. W. Parham, of New Orleans, published a most thorough and scholarly report of what had been accomplished from the dawn of time in the surgery of the thoracic wall. He had at that time operated upon two tumors of the thoracic wall requiring extensive opening of the thorax, and was obliged in the first case to combat severe shock which instantly supervened when the thorax was opened. In the second case, he employed the Fell O'Dwyer apparatus for inflation of the lungs, and was enabled to prevent collapse of the lung, dispense with irregular respiration and shock, and at the end of the operation, to suture the lung around the margin of the opening in the chest wall so that it was maintained in expansion. In his most thorough and inclusive

coagulation of 5 c.c. of blood for four and one-half hours. This would mean for a patient of average weight 1 gramme (fifteen grains), at present a rather expensive procedure, as the cost of one gramme hirudin is almost twenty dollars. The drug, injected intravenously in large amounts, proved harmless.

Some authors have called Trendelenburg's operation of little practical value, because, if the embolus is large, the patients die within a few minutes, and if it is of smaller size, it often does not endanger life and the patients do not need operation.

However, according to Trendelenburg's experience, there remains a certain proportion of patients, at least 50 per cent., in whom only one branch of the pulmonary artery becomes obstructed at first, and death does not occur until 10-60 minutes after the onset of the embolic attack. These patients present a clear indication for his operation. At least 15 minutes are usually at the disposal of the surgeon. Assistants and nurses must be trained to recognize the attack.

Unfortunately, the ever-continuing rotation in the staff of doctors and nurses in the hospitals of our eastern states minimizes this help or makes it illusory. But wherever permanency of position has been introduced, pulmonary embolism will be readily suspected or recognized, after attention has been called to the pathologic picture.

There remains, to my mind, another serious obstacle, particularly in our country, viz.: the necessity of obtaining the consent of the patient or his relatives without which this operation should not be undertaken, as otherwise conflicts with the law might be incurred by the surgeon. To obtain the consent to such an eventuality prior to the performance of the first operation, will seriously embarrass the operator's position; to ask for it after the embolus has occurred, almost without exception means fatal delay.

At the last meeting of the Congress of German Surgeons, March, 1913, Schumacher presented the experience gathered with Trendelenburg's operation in Sauerbruch's clinic at

nor blood, nor œdema, nor dropping of the tongue, nor even cessation of the respiratory movements can interfere with the air exchange. The apparatus is useful for so many other conditions beside lung surgery,—neck, tongue, mouth, pharynx, cerebrum, etc.—that it is in almost constant use in large clinics where it is employed at all.

My own excuse for reporting the case which follows is, first, the rarity of these cases; second, the exact pre-operative diagnosis which the X-ray enabled us to make; third, the extreme simplicity of the operation, and the ease with which the lung was kept in expansion with a widely opened thoracic wall; fourth, the fact that I have so far found few reported cases of chest surgery under the intratracheal method in which there were no adhesions, the lung being entirely free; and fifth, that it illustrates the importance of dispensing with drainage in these cases.

S. P., about thirty-three years of age; housework: A tall, delicate, somewhat anaemic woman. Had noticed three years before a tumor under the left arm, which at first was quite small and had recently grown rather fast.

Examination showed that she had hypertrophy of both breasts, and in the right axilla attached to the chest wall was a mass about the size of a baseball. X-ray showed that this mass projected inside the chest (Fig. 1).

At the Corey Hill Hospital, on June 19, 1912, I made a curved incision in the left axilla, starting at the level of the second rib, at the lower border of the latissimus dorsi, carrying it six inches forward on to the breast, then downward about four inches, then backward to a point below the beginning of the incision. On turning this flap backward and dissecting free the pectoralis major and latissimus dorsi from the tumor, I surrounded the tumor, taking great care not to peel the subcutaneous tissue from its surface but leaving it attached. The third, fourth, and fifth ribs were then divided by an osteotome, in front of the tumor, the pleura being widely opened. Then the ribs were divided behind the tumor, and the tumor with about six inches of these ribs removed. The operation was

results of an empyema on the twelfth day after operation.

Tiegel's apparatus appears to be best adapted for these emergency cases in man.

There certainly does not seem to be any good reason why Trendelenburg's operation should not be successfully performed in the future also on man. I feel sure that with the future evolution of thoracic surgery the large hospitals here and abroad will follow Trendelenburg's advice, to keep an instrumentarium for this work ready for instantaneous use in a specially labeled package, and make an effort to save also this class of patients, so often utterly lost without operative help.

II. *Intrapleural ligation of branches of the right or left pulmonary artery for bronchiectasis. Sauerbruch-Brunn.*

Bronchiectasis involves the bronchial tree, not the pulmonary tissue (See Fig. 7 and ANNALS OF SURGERY, vol. 52, pg. 40, Fig. 1). It is a frequent disease. In tuberculosis sanatoria and other places many patients are found who expectorate large amounts of pus and mucus, often mixed with blood and of foul odor and taste, in which, on repeated examination and inoculation of guinea-pigs, no tubercle bacilli can be demonstrated. The majority of these patients suffer from bronchiectasis. Clinical examination often brings out nothing characteristic except a few crepitant râles, usually over the lower lobe of one or both lungs; on the right side, the middle lobe is often also involved. Cases have likewise been found in which the upper lobe was affected.

Bronchiectasis is also a dangerous disease. Remarkable to state, sudden suppurative inflammation of brain and cord may follow in its wake. Personally, I have lost three such patients of a most acute purulent meningitis following preliminary incision of the lung for bronchiectatic cavities, from three to six months after the operation among ten patients thus afflicted. They died within 48 hours after the onset of the acute symptoms.

The clinical symptoms of bronchiectasis are not amenable to medicinal, serological or hygienic treatment, as in pul-

FIG. 2.



Photograph of patient after operation, showing incision.

and diaphragm with healing of the wound by granulation (Garré<sup>7</sup>).

*D. Ligation of the branches of the pulmonary artery.*  
*Sauerbruch-Brunn.*

Before the third International Congress at Brussels, September, 1911, Sauerbruch reported two cases thus treated. In his experimental work, done in connection with Bruns,<sup>8</sup> he had found that if the branch of the pulmonary artery which conveys the venous blood to the lung for ventilation was tied, in other words, if the physiologic function of that lobe was artificially inhibited, it would shrink, become adherent to the costal pleura and become transformed into a mass of connective tissue. When, later on, thoracoplasty is done, as in unilateral tuberculosis of the lung with cavity formation, the bronchiectatic cavities are compressed by the collapse and the proper, logical way for the improvement or cure of the trouble has been opened. Sauerbruch's patients, up to the time of the report, had been much improved.

So far I have employed this method in three cases. Their histories are here very briefly appended:

CASE I.—J. C., male, seventeen years old; right lung, middle and lower lobe affected; expectorated for five years following attack of pneumonia; never T. B. found; lues negative; sanatorium treatment over two years; no improvement.<sup>9</sup> Clinical symptoms slight, point to right, middle and lower lobe; corroborated by X-rays. Quantity of sputum 350–400 c.c. in 24 hours; mucopus of foul odor, mixed with blood.

*Operation* (April 4, 1912).—Previous forced expectoration; regional anæsthesia, with novocain 1 per cent. + suprarenin (Hoechst's tablets, freshly dissolved), of fourth to seventh thoracic nerves, inclusive; negative chamber; expectorates almost 100 c.c. during the first three-quarters of an hour of operation. Left lateral position; incision in right, fifth intercostal space, after previous injection with novocain solution, painless; rib spreader put in place; patient still has no pain, but does not like

<sup>7</sup> Mittheilungen aus den Grenzgebieten, vol. xxiii, 3.

<sup>8</sup> Centralblatt f. Chir., 1908, pg. 1405.

<sup>9</sup> This patient was sent to the German Hospital for treatment through the courtesy of Dr. McSweeny, then physician-in-chief of the tuberculosis sanatorium in Otisville, N. Y.

FIG. 4.



X-ray taken April, 1913, showing thickening of the pleura and absence of tumor.

In view of the rigid asepsis carried out, it is assumed that possibly the pulmonary adhesions contained dormant encapsulated bacteria which became virulent after operation.

CASE III.—T. M., male, twenty-two years; five years ago pneumonia; two months in bed; since then abundant expectoration; about one-half cupful every two hours, day and night, often mixed with blood, and of sweetish taste; sleep much interfered with; cannot attend to business; medical treatment brings no relief; clinical examination points to right lung, middle and lower lobe; radiography corroborates this; quantity of sputum 350-400 c.c. in 24 hours.

*Operation* (February 25, 1913).—Negative chamber; regional anaesthesia, third to sixth thoracic nerves; local in fifth interspace; work painless; rib-spreader produces feeling of pressure, but no pain; manipulations in thorax start cough. No adhesions between costal and pulmonary pleura. Interlobar space can be well entered; field deep; adhesions there clipped with scissors; lung tissue, drawn out into one of these adhesions, injured; exit of some purulent material; bronchus exposed; artery as usual, toward "north" of same; located and freed; two black colored lymphatic glands tightly adherent, loosened with difficulty; pronounced periadenitis; slight venous oozing; at this time a few drops of anæsthol were administered, 8 c.c. in all, but pulse rose; patient became cyanotic; anaesthesia stopped; better; silk ligature around vessel feeding lower lobe; search for artery of middle lobe not pressed on account of patient's condition. In view of contamination of pleural cavity, drainage decided on; counter opening in eighth intercostal space; short cigarette drain and two split rubber tubes introduced; main wound closed; rubber dam over drains; large dressing; differential pressure after treatment for 15 hours. First day satisfactory; then rise of temperature and subcutaneous emphysema of right side of abdomen and scrotum, also up to right side of neck; some dyspnoea. Third day middle of intercostal wound reopened; exit of serous fluid with air; no communication from drainage canal to upper cavity, into which two rubber tubes are introduced; lower lobe of lung had already become tightly adherent to chest wall; gradual improvement.

March 15: Beginning to inhale superheated air produced by electric hot-air douche, four times in 24 hours, gradually up to



Among the more interesting communications on tumors of the chest wall is an article by Rixford in the *Transactions of the American Surgical Association*, 1905, volume xxiii, in which he reports four cases of resection of the chest wall for recurrent carcinoma of the breast, and one of sarcoma of the clavicle involving the first rib and sternum. He used a wet towel tucked under the opening in the chest as soon as it was made to occlude it, thus closing the opening and checking the lateral excursions of the lung and mediastinal tissues. The towel was folded on itself two or three times, and slipped beneath the partially loosened section of the chest wall at the moment of complete expiration when the chest was largely emptied of air; and in all the cases there were no untoward symptoms from pneumothorax. No drainage of wounds or pleura.

REHN, *Archiv. für Klinische Chirurgie*, 1906, 81, p. 362, reports three cases of tumors of the chest wall, involving the removal of large portions thereof. He considers the operation dangerous. Campo, he says, has collected reports of 57 cases, of which 11 died as a direct result of the operation. Removal of chest wall tumors when the pleura is not opened is not a serious matter. Opening the pleura is in itself serious, and only one recovery is reported in literature where both pleuræ were opened: that of Franz König. Rehn advocates suture of the lung to the pleura with a large curved needle before opening the latter; and as soon as the pleura is opened, drawing the lung out with the hand by means of warm, moist compresses. At the close of the operation, he sutures the lung to the chest wall, and closes the skin without drainage.

DOLLINGER produced pneumothorax by making a cut into the pleura several days before the removal of a tumor of the chest wall, so that it may not be immediately produced at the time of the operation.

SAUERBRUCH reports two cases of resection of wall of thorax for carcinoma of mamma; one was adherent, one a recurrence after removal of a breast cancer. In the first case, the breast and infiltrated soft spots were removed with resection of two ribs. A flap of skin from the side was laid upon the lung with no distortion, and healed normally in place. The flap was the size of the palm.

In the second case, three ribs were removed, with soft parts, leaving an area thirty centimetres long by twenty-one centimetres wide, and pleura also to this whole extent. No pleural adhesions, and sound lung. The large area was covered by a flap from the side and transplantation of the opposite breast. Good recovery of patient and gain in weight.

C. B. Lockwood, in *The Clinical Journal*, September 25, 1907, reports

time the superior vena cava outward, or outside of the pericardium through an incision of the pleura, right above the vena azygos (see Fig. 9 with legend). More experimental work must clear up this point.

I would like to mention here a rather strange observation. After ligation of the main branch of the pulmonary artery (left) we had expected a reduced hemorrhage (return blood) on puncturing the blood-vessels that run on either side of the bronchus. This was not so. It bled freely so that we had to ligate. Where did this blood come from? We had beyond doubt securely closed the artery, for the vessel was divided between two ligatures, and when the dog was killed at the end of the experiment by stopping the differential pressure this point was carefully investigated and corroborated. It did not bleed synchronously with the respiration so that we could exclude distention and collapse of the lung being responsible for the phenomenon. It is further hardly conceivable that the small bronchial arteries, though coming directly from the aortic arch, should throw such an amount of blood into the lung as to produce a hemorrhage of such intensity; besides, as far as known, there exists no communication between pulmonary and bronchial arterial system, for obvious reasons, as the one carries venous the other arterial blood. The left lung also did not become so profoundly anaemic in several experiments as did the right lung after intrapericardial ligation (one observation). We had no time to repeat these experiments much to our regret, and did not test the branches of the right pulmonary artery alongside the bronchi, as we wanted our dog to live, if possible. I therefore mention the observation here for what it may be worth. If corroborated, then there must be some kind of collateral circulation in the left lung of the dog. And if the same anatomical condition should exist in man, it would help to explain how patients with partial or rather gradual severe pulmonary embolisms may recover.

In the human being the right heart is situated almost entirely behind the sternum. Trendelenburg's incision trans-

## ABSTRACTS OF REPORTED OPERATIONS FOR SARCOMA OF CHEST WALL.

Name and Date.	Operation.	Method contra Pneumo-thorax.	Shock.	Result.
Webber ( <i>Lancet</i> , 1900, ii, p. 1347).	Removal of sixth left rib with tumor. Left pleura and pericardium freely opened. Left lung collapsed.	Not mentioned.	Not mentioned.	Recovery in spite of bronchitis.
LeDentu ( <i>Bull. et z Mem. de Soc. de Chir. de Par.</i> , 1902, 28, p. 244).	Removal of parts of 3 ribs for chondrofibroma with small portion of dia-phragm.	Traction on lung. Pleura opened freely and as late as possible. Drainage of pleura. Suture of lung to skin flap.	Marked on opening pleura.	Double pneumonia followed, which still existed at date of report, 2½ months after operation.
Griffith ( <i>Lancet</i> , 1902, ii, p. 991).	Resection of sternum from 2d to 7th costal cartilages. Left pleural cavity opened. Growth (sarcoma) not completely removed.	None. Pleural opening could not quite be closed by sutures.	Slight.....	Recovery from operation. Death 4 mo. after.
Delorme and Piollet ( <i>Lyon Med.</i> , 1902).	M.30. Tumor attached to 7th, 8th, and 9th ribs. Removed. Pleura widely opened. Lung retracted deeply. Small gauze drain in pleura.	No apparatus..	No shock.....	Recovery.
Israel ( <i>Berl. klin. Woch.</i> , Mar., 1903, No. 22).	Removal of a tumor of the body of the 6th dorsal vertebra. Small opening of pleura was made.	Opening stopped up with gauze packing.	No shock.....	Recovery.
Reeve ( <i>ANNALS OF SURGERY</i> , 1903, 37, p. 724).	Resection of 3 ribs on right for tumor. Opening in pleura size of 2 hands. Diaphragm injured but not opened.	Not stated....	No shock.....	Recovery.
Rixford (1905, <i>Transactions, Am. Surg. Assoc.</i> , vol. xxiii).	Four cases: 3 of carcinoma of chest wall secondary to breast carcinoma. One sarcoma of clavicle involving 1st rib and sternum.	Hot, wet towel tucked under edges of opening so as to close it as far as possible.	Not present on opening pleura.	All recovered.
Deruginsky (Am. <i>Surg.</i> , 1906).	1st: removal of parts of 8th and 9th left ribs. 2d: removal of all left thoracic wall from 7th to 11th ribs with a portion of dia-phragm.	Gauze tampon.	Did not ensue upon opening pleura.	Recovery.
Torek ( <i>Post Graduate</i> , N. Y., 1906, p. 335).	Removal of 4th, 5th, 6th, and 7th ribs for sarcoma, with portion of lung. Numerous metastases in pleura and lung.	None.....	Severe.....	Death from shock.
Rehn ( <i>Archiv. klin. Chir.</i> , 1906, 81, p. 362).	1. Removal of portions of 3rd, 4th, 5th, and 6th ribs for recurrence after carcinoma of the breast. 2. Removal of 12 cm. of 4th and 5th ribs. (Right) for sarcoma.	Lung drawn out and sutured to chest wall.	None.....	Recovery and long freedom from relapse.
		Lung drawn out and sutured to opening in chest wall.	None.....	Recurrence. Death from secondary operation, 3 months later.

More difficult is the answer to the second question. In order to render it, the pathologists must tell us whether the upper lobe is really entirely healthy in the majority of these cases. It is surely a fact that they have been found involved. But assuming, for argument's sake, that they are not, that they represent an unaffected part of the lung, then we know from experimental surgery that the sudden dropping out of the work of one entire lung, as in total pneumectomy, is so easily borne by the animals, that on the first day after the operation they bark and move about as vigorously as if nothing had happened. We have, as is well known, an abundance of lung and get along nicely with one lung. Naturally, if both lower lobes are the seat of the disease the peripheric ligation must remain the operation of choice.

Observations have not been carried out sufficiently long, of course, to allow conclusions as to the real value of the ligation of branches of the pulmonary artery in the treatment of bronchiectasis. We must not forget that the bronchial walls, which are the seat of the disease, are nourished by the bronchial arteries and that the pulmonary vessels attend to nothing but to transporting to the lung venous blood for ventilation. If after ligation of the main trunks, prolonged inhalation of superheated air and subsequent collapse therapy by means of thoracoplasty, the disease should not be cured, but the symptoms only alleviated, then this procedure should take second place, and all efforts should be concentrated on the last operative possibility:

*E. Pneumectomy.* Personally I believe that we shall learn to do this operation also in the human being with less danger than many investigators have attached to its performance. If the vagus reflexes and those from the sympathetic system can be overcome, possibly also with the help of cocaine or its derivatives, there is no reason why man should not stand the operation as well as animals, since we have learned how to make the bronchial stump air-tight after amputation of the lung. Efforts of surgeons operating in this field will certainly move in that direction in the near future.

out special apparatus; and also that the same cases operated upon under intratracheal anaesthesia would do still better than in the cabinets, and at vastly less expense and trouble. I feel, indeed, that we can hardly better express the contributions of the intratracheal addition to thoracic surgery than in the words of Gosset: "La peur du pneumothorax ira retrouver la crainte du peritone."

I wish to acknowledge my indebtedness to Dr. Samuel Robinson for his kindness in letting me see his cases in consultation and for furnishing me with references to literature.

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along the intercostal space toward the sternum and the posterior end of the ribs. Sometimes the vertebral bodies may be attacked without its being seen on the outside. After expanding for a certain length of time on the outside these tumors extend inward and project into the intercostal space. The pleura over them is thickened at first, and finally invaded by the tumor. The visceral pleura is rarely involved because the tumor does not become adherent and extend over to the lung. The lung, as in the cases reported in this paper, may be deeply indented by the tumor without becoming adherent to the pleura. In rare cases, adhesion of the visceral pleura and invasion of the lung does, however, take place. Numerous authors have reported removal of a portion of the lung in the removal of these tumors, among whom may be mentioned Voutier, Tropinow, Sedillot, Helferich, and others. Nevertheless, the direct invasion of the lung by the tumor even when the lung is adherent is rare. Invasion of the pericardium also is rare, but extensions to the diaphragm are more common.

The dangers attendant upon the opening of the pleura in the early days were very great. Of the very few cases reported in literature in the pre-aseptic period, almost all died. If they survived the hemorrhage and shock of a formidable operation with opening of the pleura, they died of infection; and in the early days of the antiseptic method, they began to die of carbolic acid poisoning. Naturally, tumors of the chest wall were allowed to attain a great size before the danger of an operative attack was thought to be justified, and the mortality of the operative cases was high. The shock of operating upon the chest wall is great in proportion to that in other parts of the body: 1. Because of the interference with respiratory rhythm; 2. The nearness of the heart and great vessels; and 3, and most important, to the fact that when the pleura is widely opened there is interference with respiration and circulation on account of the sudden collapse of the lung. The collapse is due to the altered conditions of

## ACUTE PERFORATING SIGMOIDITIS IN CHILDREN.\*

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ALTHOUGH our knowledge of acute and chronic inflammations of the sigmoid as distinct surgical entities dates back less than twenty years, case reports have been so numerous that to present another to the association would be without justification, unless it presented some unusual features. In nearly all cases, at least in adults, the immediate cause of the acute inflammation is an obstructed diverticulum which shows *a priori* that an acute process has been grafted on a chronic one. In the majority of cases the chronic process which leads to diverticulation does not make itself manifest, until obstructive symptoms arise or until a gross perforation or a pericolic infection through a still unbroken but permeable wall takes place. How innocuous a chronic diverticulitis may seem is shown by the case of Brewer<sup>1</sup> in which two operations, six years apart, were performed on a patient who seemed perfectly well in the interval. This latency of a condition potential of great disaster is a not unimportant one of the many points of analogy between inflammatory conditions of the two lower abdominal quadrants. That an analogy, one might almost say an identity, of the sequences of the pathologic processes in the appendix and the sigmoid diverticulitis exists may be assumed as absolute, although according to Powers<sup>2</sup> hardly more than a dozen cases of acute diverticulitis operatively treated have been reported.

In a negative way the analogy might be continued, for as suppurations in the right lower quadrant may originate in the intestine independently of the appendix, so I take it that in more frequent instances will suppuration about the sigmoid

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\* Read before the American Surgical Association, May 8, 1913.

article, Parham reports all the cases of surgery of the chest wall in which the pleura had been opened, published up to the time of his own cases,—only fifty-two in number—and analyzes them from every point of view. The chief point of practical interest was the study of the effects of the pleural opening. A small pleural tear quickly controlled by stopping the opening with gauze or other pads was shown to have produced little shock. The presence of adhesions prevented shock by inhibiting collapse of the lung. The wide opening of the pleura, with the sudden entrance of a large current of air, intensified the shock to an extreme degree. The methods by which this had been controlled had been the covering of the pleural opening by the finger, compresses, or suturing; traction of the lung into the opening, stitching the lung into the opening (Tuffier, Beyer, and Parham); substitution of temporary hydrothorax for pneumothorax (Witzel); injection of sterilized air (Lowson); Quenu and Longuet's intra-bronchial tension; O'Dwyer's method, etc. Parham speaks enthusiastically for the Fell O'Dwyer apparatus; yet after his paper was published, various operators (Rixford, Porter, and others) reported cases of tumor of the chest wall successfully performed without special apparatus, in which various rough expedients were adopted to close the opening in the chest. Perhaps this was because the cases were so rare that when they presented themselves few surgeons had the special apparatus at hand.

Then came the important work of Sauerbruch, Brauer, Willy Meyer, Robinson, and others, which provided us with pressure cabinets, the cumbersome nature and expense of which, in proportion to the rarity of the cases in which they were of benefit, precluded their general adoption; and then the intratracheal anæsthesia, which places within the reach of every surgeon a safe and simple apparatus which does everything that the pressure cabinet does and even more safely for the patient. The superior safety of this method lies chiefly in the fact that with the catheter in the larynx and the air current rushing outward around it, neither mucus,

*Condition on Admission.*—The patient presented the general appearance of suffering. He frequently cried out with pain. The temperature is 101.8, pulse 132. Abdomen is distended. The costal arches cannot be seen. On percussion there is general tympany with liver dulness somewhat pushed up. Although there is general muscular rigidity no special tenderness can be elicited. The examination is very unsatisfactory by reason of the child's resisting. Urinalysis negative.

*Blood Examination.*—White 15,800—polymorph. 53.11, small mononuclears 26.09, large mononuclears 20.09, eosinophiles 0.71.

An X-ray picture taken after the ingestion of a bismuth meal shows no intestinal occlusion, but a general gaseous distention. Digital examination of the rectum indicates some resistance on the left side of the pelvis, but it is not very distinct. Within the next two days the patient's condition did not improve. There was occasional vomiting of biliary matter, but no stool was passed. The blood count, October 23, was only 11,800 white. On October 24 it had risen to 22,000 and on the morning of the 25th to 33,000. At this time the rectal examination showed a distinct infiltration on the left side of the pelvis. It was then only that consent for an operation was obtained.

*Provisional Diagnosis.*—Appendicitis with left sided pelvic abscess.

*Operation.*—Jewish Hospital, October 25, 1912. Gas oxygen anaesthesia. When relaxation was obtained a very decided induration was observed for the first time in the left lower quadrant, wherefore, a pararectal incision was made on the left side.

On opening the peritoneum a slight amount of clear fluid escaped. The intestines were moderately distended. A mass on the left side contained the sigmoid with adherent overlying omentum. The latter was gently separated from the underlying intestine, whereby an abscess containing two or three ounces of very fetid pus was opened. The greater part of the purulent accumulation came from the left side of the pelvis. On widely retracting the wound margins and gently separating the omentum the entire sigmoid was exposed. For about three inches the walls were very much reddened, thickened and indurated. The entire mass was fixed on the iliac pan. The tinea could not be made out, but a number of appendices were exposed. Except

FIG. 1.



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seven chronic cases, places the average age of diverticulitis at a little less than fifty-four years. Of one hundred and five cases of intestinal diverticulum cited by Telling<sup>4</sup> there was only one under forty years old. Hartwell,<sup>5</sup> it is true, conceded three cases occurring at the ages of seven years, six years and ten years respectively. The last two cases were obtained by autopsy. The diverticula were congenital and had nothing to do with the cause of death.

In the first case reported by Ashhurst,<sup>6</sup> the patient was operated upon and a mass found in the mesosigmoid. Ashhurst, himself, is in doubt as to the existence of a diverticulum in the mesenteric attachment of the gut as the primary cause of the swelling in the mesosigmoid. Therefore, he concedes that his diagnosis of mesosigmoiditis is conjectural. Another case of suppurating diverticulitis in a child which is often quoted is that of Walcha.<sup>7</sup> The patient, a ten-year-old girl, had passed a round worm two days before the onset of the symptoms. An abscess formed on the left side of the abdomen and the child died on the sixth day, evidently from peritonitis. There was no autopsy and there is no reason for believing that this was a case of diverticulitis.

It is probable that in the second case above reported we had to deal with a lymphangitis, which resulted in abscess from infection through an intact intestinal wall or a lymphadenitis from the same cause. When one considers the wealth of lymphatics in the intestinal wall and the frequency of infections of the intestinal mucosa, it is really remarkable that intramesenteric suppurations (of the nature of the case reported) are not more common.

If we except the doubtful case of Ashhurst as the only one operated on for diverticulitis in a child, there is no recorded case. In the two cases of sigmoid diverticulum discovered by autopsy in children by Hartwell, there were no clinical evidences of the condition. In an examination of five infants who had died from various infantile diseases Hartwell and Cecil found that in three there was some evidence of a weakness at one or more points. In each of the positive

FIG. 3.



X-ray of left chest taken October, 1912, four months after operation, showing absence of tumor.

in young subjects and only two of them were over forty. This is in marked contrast with the age history of acute or, for that matter, chronic diverticulitis which come to either operation or autopsy. The findings at operation in Case I so far as the induration, infiltration and fixation of the sigmoid are concerned were very much like those encountered in the case recently reported by Dowd.<sup>9</sup> Here, however, the inflammation involved the descending colon from the splenic flexure quite to the sigmoid. It was found to be red and hard and the walls so thickened that it seemed almost a solid mass and the consistency was nearer that of a garden hose than that of the normal intestine. The microscopic examination revealed great œdema with polynuclear cell infiltration of the mucosa with purulent exudate replacing the mucosa in most places. Had it been possible in Case I to obtain a section of the thickened sigmoid, I am quite certain that the picture would have been the counterpart of Dowd's case.

That sigmoiditis is a clearly defined morbid entity has been established since the articles published for Mayor,<sup>10</sup> Matthews,<sup>11</sup> Rosenheim<sup>12</sup> and Durant<sup>13</sup> in 1893, 1902, 1904, and 1911 respectively. The important factor of the diverticulum, of which the significance was later recognized, has threatened to overshadow the sigmoiditis unassociated therewith. Of course, the acute process when limited to the mucosa is often but a part of a colic infection of the sigmoid, but by reason of the position and function of the sigmoid, manifests itself there with greater severity. It may be necessary only to recall that here the fecal contents stagnate before their final expulsion and the time and opportunity for infection are perhaps greater than anywhere else, with the exception of the cæcum. That the effect in the long run is more baneful to the sigmoid is amply shown by the foreshadowing preponderance in the sigmoid of the chronic diverticulitis with its well-established train of symptoms.

Although two cases of left-sided lower quadrant intra-abdominal suppuration in children are scarcely enough to be statistically valuable, when considered with the hitherto pub-

FIG. 5.

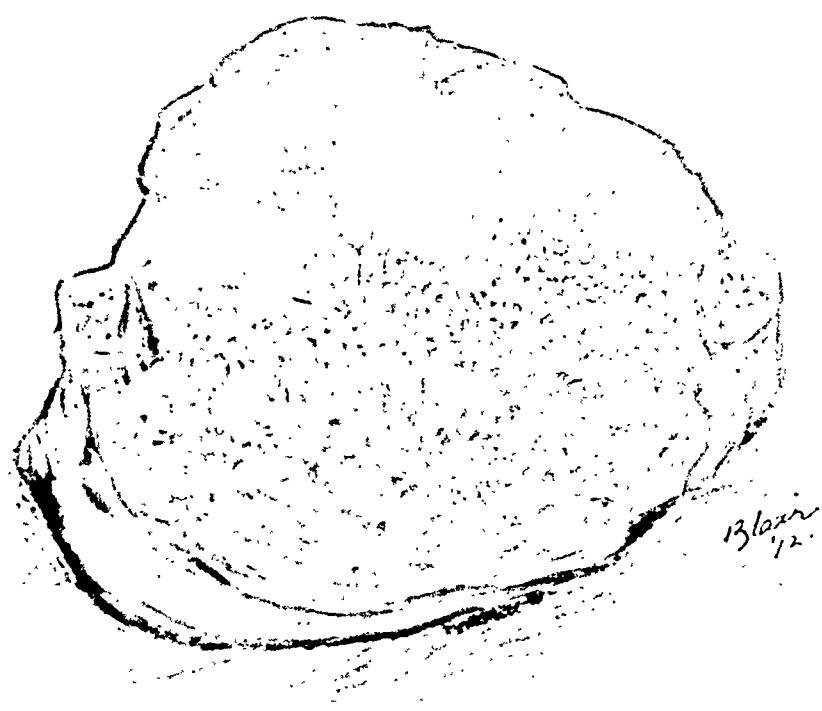
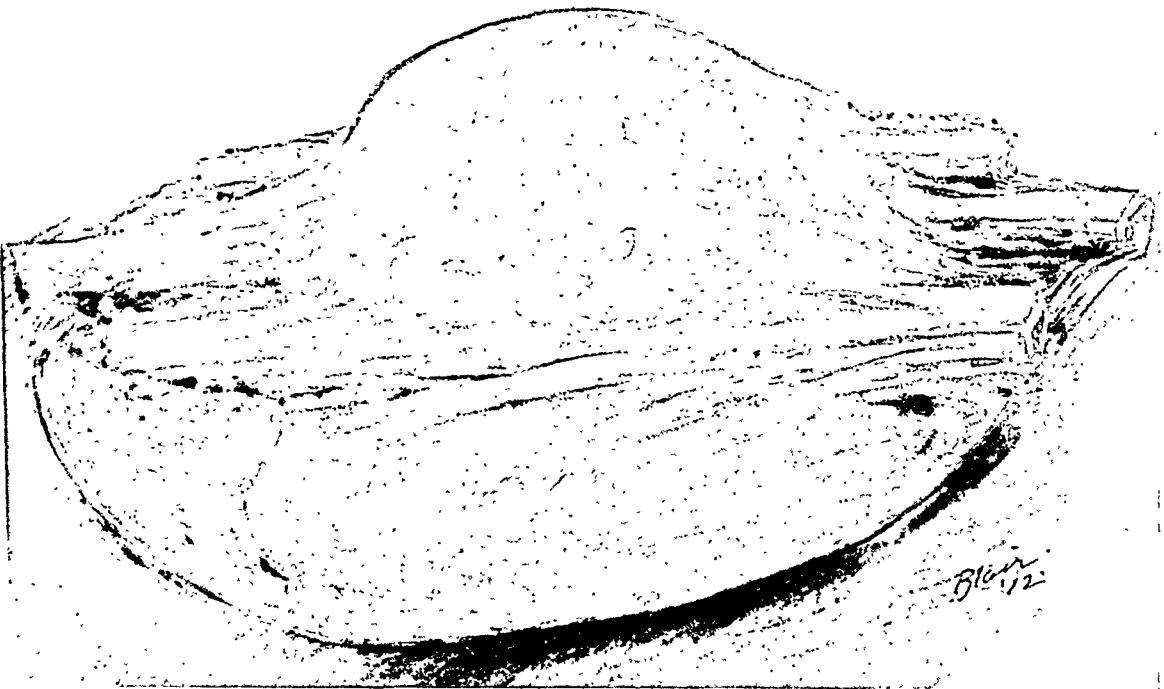


FIG. 6.



FIGS. 5 and 6.—Specimen of sarcoma of ribs.

ON EXCISION OF THE INFARCT IN ACUTE  
HÆMATOGENOUS INFECTIONS OF  
THE KIDNEY.\*

BY LUCIUS W. HOTCHKISS, M.D.,  
OF NEW YORK,  
Surgeon to Bellevue Hospital.

IN recent years considerable attention has been directed to the study of acute hæmatogenous infection of the kidneys: The lesions which have been found are frequently unilateral, fairly characteristic, but by no means uniform in character or extent. Congestion, more or less intense and extensive, with œdema of the perirenal fat, infarctions, red and white, single and multiple, have all been described, singly or in combination. Brewer, who reported his first case in 1904, and later wrote extensively on the subject, has been a pioneer in calling the attention of the profession to the comparative frequency of its occurrence, as well as to the necessity of early diagnosis and radical surgery in the more severe cases.

A study of Brewer's cases, in his paper of 1906, most of which were of the severe septic type, with multiple scattered abscesses throughout the cortex, and with a clinical picture of profound sepsis, will show the wisdom of radical measures, viz: nephrectomy, in this variety.

The reports of Farrar Cobb, 1908, and later of Cotton, 1911, call attention to milder types of infection and the results from conservative measures.

A study of two very unusual cases of my own, which form the basis of this brief paper, reveals a type of acute unilateral septic infarct of the kidney wherein the lesions are discrete rather than scattered, and limited in both instances, to the upper pole and portion of the right and left kidney respectively.

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\* Read before the American Surgical Association, May 8, 1913.

done under intratracheal anaesthesia, and the lung was kept continually blown up with the bellows until its close. It being then necessary to sponge out some blood which had run into the pleura, the lung was allowed to collapse and the cleansing of the pleura was easily accomplished. There was a good deal of hemorrhage from the muscular tissue. The intercostal arteries were tied and all hemorrhage stopped as far as possible; then, the lung being blown up so as to fill the pleura entirely, the greater pectoral and latissimus dorsi muscles were sewn together across the opening with interrupted sutures of catgut. The skin was then sewn with a Bartlett suture of silkworm gut (Fig. 2).

The patient bore the operation well and was in good condition the next day. On the second day, her breathing became rapid and irregular, and she became somewhat cyanotic. I found some dulness over the lower part of the pleura, tapped the chest, and after removing about nine ounces of blood, the symptoms were relieved.

Two days later, the symptoms returned to a slight extent, and I again tapped the chest, and this time got four ounces. The patient ran a rather rapid pulse, 100 to 120, and a slight temperature for two weeks. This temperature was undoubtedly due to absorption of blood clot.

It is possible that the negative pressure caused by tight suture of the pleura may have at first tended to increase the hemorrhage but I do not believe that this was a serious factor. There was slight dulness over the lower part of the chest and bronchial respiration over the upper part, the upper back, the middle back, and the upper front. The temperature fell to normal at the end of two weeks, and the wound healed by first intention. She went home in three weeks and has since been well. I present an X-ray (Fig. 3) taken in October, 1912; and another one (Fig. 4) taken in April, 1913; showing a slight shadow on the left, probably due to thickening of the pleura, but the entire absence of any signs of tumor, the ends of the ribs showing clean edges where they were cut off (Figs. 5 and 6).

A brief review of the literature since Parham's paper in 1898 shows that twenty-eight cases have been reported.

due to use of the catheter, as he denied all venereal disease, and the smears were negative. A provisional diagnosis of acute cystitis, with a non-specific urethritis was made, and treatment with hot stupes locally and urotropin and catheterization, was instituted. An examination of the urine at this time showed a specific gravity of 1022, acid reaction, a trace of albumen, and many white and red blood and pus cells. Albumen was never demonstrated in any of the later specimens which were frequently examined, and the rest of the microscopic picture remained about the same, with the pus cells steadily diminishing as the cystitis improved. An examination of the urine for tubercle bacilli was negative.

For the first week, under regular catheterization, and irrigation of the bladder, with boric acid solution and argyrol, he improved steadily and began to void his urine naturally though with some pain.

On March 1 he complained of pain in the region of the right kidney which was increased on deep inspiration and was accompanied by tenderness along the lower right costal margin. This tenderness was most marked over the region of the gall-bladder, but there was no muscle spasm in this situation. There were no signs of pneumonia.

On March 8 as his temperature, which had been moderate, had suddenly shot up to 104.4° the day previous, and his white blood count had risen to about 14,000, with a polynuclear percentage of 80 per cent., I was asked to see him in consultation with Dr. Hyde, who had made a tentative diagnosis of kidney infection. At this time the tenderness over the bladder had entirely disappeared but there was extreme tenderness over the right kidney and extending forward to the middle line of the abdomen. As the case seemed to be one of probable renal suppuration and his condition was getting worse daily, an operation was advised.

*Operation (March 12, 1909).*—(Dr. Hotchkiss, with the assistance of Dr. Hyde and staff.) An oblique right lumbar incision exposed the kidney which was found to be adherent by its upper pole to the under surface of the right lobe of the liver, and when the somewhat dense adhesions were broken down, a perirenal abscess was opened in this situation which contained a moderate amount of pus, and was well encapsulated.

two cases of tumor of the chest wall, one a carcinoma following carcinoma of the breast. The patient with carcinoma of the chest wall, in which several pieces of several ribs had to be removed and the pleura opened widely, recovered and was well for a year. The second case was one of spindle-celled sarcoma of the chest in a girl of seventeen years. Portions of the fifth, sixth, seventh, and eighth costal cartilages were removed. The diaphragm was infiltrated and the peritoneal cavity opened, and the apex of the pericardium also removed. There was some shock at the time the pericardium was opened. A portion of the lower lobe of the left lung was removed. Hemorrhage from the lung was stopped by a cautery. After removal of the tumor and closing of the opening in the peritoneum and pericardium, the thoracic wound was closed without drainage. There was very severe shock. The patient rallied, recovered, and was well six months afterward.

W. O. ROBERTS, *Louisville Journal of Medicine and Surgery*, January, 1906, speaks of thoracic resection for tumor growing from the bony wall of the chest. Found a small tumor, and the rib from which it was growing was removed.

Other cases reported in the literature will be found in the following table. On looking these over, it will be seen that as far as the table goes, there is little difference in the above as to whether Sauerbruch's cabinet was used, or the pressure apparatus, or simply closing the pleura with compresses. It will be found, for instance, that there were 28 cases reported, of which 26 recovered and only 2 died,—a very small mortality; that in only 3 of the cases was either the Sauerbruch cabinet or positive pressure employed; closure of the opening by compresses or traction on the lung was employed in 11 cases; shock was present in 9 cases, absent in 13, and not mentioned in 6. Murphy's positive pressure apparatus was employed in one case.

These are all the cases that I have been able to collect since the publication of Parham's paper in 1898.

As far as one can tell, the sudden wide opening of the pleura tended to produce shock, and the opening of the diaphragm produced shock whether positive pressure apparatus was or was not used. I think there is no doubt, however, entirely irrespective of statistics, that in cases of equal severity those operated upon with positive or negative pressure would do better than the same cases operated upon with-

Chief complaint, sharp pain in the left axilla. On examination, he did not appear to be acutely sick. His chest showed fairly good expansion, respirations were normal. There were a few fine râles at the extreme right base, and a few pleuritic râles at the base of the left axilla. Pulse regular and normal as to rate and force. The heart is negative. Abdomen, also negative.

Provisional diagnosis, pleurisy. Temperature on admission,  $101^{\circ}$ ; pulse, 90; respirations, 24. Urine, cloudy, amber, 1029, alkaline, negative as to albumen, blood, bile, casts, pus, indican, and acetone, triple phosphates present. Aspiration of the chest on the day following, yielded no fluid.

Dec. 27: Temperature  $102^{\circ}$ ; pulse 98; respirations 24; Widal, negative; white blood count 26,000; polynuclears 91 per cent.

Dec. 28: Sibilant and sonorous breathing and many fine râles at the left base. Aspiration at base of left lung, yields few drops of pus—a smear from which shows cocci; temperature  $100.4^{\circ}$  to  $103.4^{\circ}$ ; pulse 72 to 90; respirations 22; white blood count 31,400; polynuclears 93 per cent.

Dec. 30: Temperature  $100.6^{\circ}$  to  $104.6^{\circ}$ ; pulse 78 to 90; respirations 24; white blood count 26,400; polynuclears 90 per cent.

Dec. 31: Signs of fluid at the base of left lung, more marked, and pus found on aspiration.

January 18, 1912: Left chest aspirated between the eleventh and twelfth ribs, and 3 inches from spine, and 2 c.c. of fluid pus obtained.

*Urinalysis.*—Amber, slightly turbid, 1029, faintly alkaline, faint trace of albumen, occasional white blood cells and triple phosphates. Temperature  $102^{\circ}$ ; pulse 100; respirations 24. Transferred to surgical side as case of empyema of lower left chest for operation.

In view of the history, the site at which pus had been obtained by aspiration, between the eleventh and twelfth ribs, a diagnosis of abscess below the diaphragm in relation with the left kidney was made by the writer.

*Operation.*—A vertical incision dividing the twelfth rib and prolonged downward over the left kidney was made and a small abscess was found below the diaphragm in close relation with

## THE TECHNIC OF NEPHRO-, PYELO- AND URETEROLITHOTOMY.

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I WAS first inclined to bring this subject before the Association because of my own interest in it but was later confirmed in my intention by discovering that only twice in the history of the Association have the different methods of removing stones from the kidney and ureter been a subject of consideration. It was in 1880, the year the American Surgical Association was founded, that Henry Morris first performed deliberately the removal of a stone from an otherwise healthy kidney. In 1895 there were three papers bearing on the subject read at the meeting in New York, that by Fenger on the "Surgery of the Ureter" being perhaps the most complete and satisfactory discussion that has ever been presented anywhere. The early work of Fenger and Cabot in renal and ureteral surgery must ever be a matter of pride with us. Again, in 1908, there were three papers presented (Bevan, McCosh, and Brewer) which produced a general discussion on renal surgery. At this time there was no unanimity of opinion regarding the best method of removing stones from the upper urinary tract but I believe to-day, in the light of improved diagnostic measures, satisfactory functional tests, perfected technic and greater experience, we may expect to find that there is a greater uniformity in our practice.

*Nephrolithotomy and Pyelonephrotomy.*—The life of nephrolithotomy corresponds to that of this Association as I have said, but for a number of years its tenure was a very doubtful one. As late as 1893, Ashurst (*Principals and Practice of Surgery*, 1893), summarized the subject as follows: "The operation appears to have been performed in

the stone. When carefully carried out I think it will demonstrate nearly any stone. Needling is a most unsatisfactory procedure and I think a dangerous one. I have removed a stone which needling failed to locate at a previous operation. If palpation fails to reveal a stone which is shown in an X-ray plate, the kidney or its pelvis should be opened and palpation carried out from within the organ. If the X-ray fails to show a stone and if palpation does not reveal it, I should not feel justified in opening up the kidney or the pelvis, unless I thought the symptoms were caused by some other condition which the further exploration might expose. A good X-ray plate of the entire urinary tract is essential to-day in the search for calculi and more and more do we depend upon it. It not only shows the location but the number of stones and, if a stereopticon plate, the relative position of the stones. The X-ray has done more than anything else to prevent extensive mutilation of kidneys in the search for stones. We hear less and less of cases where the plate showed no stone and yet one was found at operation. In delivering the kidney care must be taken not to injure it, tear its vessels, or tear the peritoneum. Better work and easier can be done with the kidney drawn entirely out of the wound and this should be one of the steps of the operation unless the dangers outweigh the advantages, as may be the case where there are extensive inflammatory adhesions. Having confirmed the X-ray findings and located the stone, the method of removal must be considered and here three procedures are open to us; each having its advantages in certain cases. They are the opening of the pelvis (pyelotomy), the formal splitting of the kidney a short distance back of its convex border where there are fewest vessels (Kelly), and direct incision immediately over the stone. In the early history of kidney surgery the incision into the pelvis for the removal of stone got a severe setback because it was apparently shown that persistent fistula was much more common than after nephrotomy. Even in 1908, at our last discussion of this subject, although Bevan in his paper advocated its performance where there was a choice,

colon develop without a diverticulum as the primary cause. All the reported cases of diverticulitis which I have been enabled to examine have been in adults, mostly in males in mid-life and given to obesity. It is almost impossible to conceive of an acquired diverticulum in a child, wherefore, I have designated the following case one of perforating sigmoiditis.

CASE I.—R. H., aged three years, male. Was admitted to Jewish Hospital at 8 P.M., October 22, 1912. During seven days before his admission he had been under the observation of Dr. Bird, of Greensburg, Ind., to whom I am indebted for the following history. While in the hospital Dr. Rachford was consultant.

*Family History.*—Father had tuberculosis of knee, mother had tuberculous glands of the neck up to her fifteenth year. Two older children had always been well. The child had always been well save for a marked tendency to constipation.

The present illness began as a slight indisposition with loss of appetite and marked constipation. This was attributed by the mother to her failure to pasteurize the milk as had been her custom up to the onset of the present illness. The evening temperature was 100 and pulse rate between 90 and 100. Constipation was the marked symptom. The exhibition of castor oil and saturated solutions of magnesium sulphate together with high enemata failed to effect. The highest temperature recorded up to the fourth day was 101. Satisfactory examination of the abdomen could not be made since any effort to make it brought forth violent crying spells. On the fourth day alboline was given in dram and later in half tablespoonful doses. This seemed effective for on the fifth day a small stool from the upper bowel was passed and contained a small quantity of alboline. A second stool containing a free admixture of alboline was passed. Altogether eleven ounces of alboline had been given. On the sixth day there developed a very sharp attack of abdominal pain, which lasted more than an hour. This was followed by accesses of vomiting. There also developed a marked distention of the abdomen and the temperature rose to 103. There were no further stools, nor was there discharge of any kind from the rectum.

kidney cannot be delivered, but damage to the vessels by this method of compression is always possible. Care must always be exercised to avoid the breaking of a stone because if any particle is left it will surely increase in size and necessitate another operation or pass down into the ureter and perhaps not out through the urethra. Also every stone shown in the X-ray plate must, like sponges in the peritoneal cavity, be "removed or accounted for." Closure of the pelvic wounds should be neatly done with small catgut on a round needle and the fatty layer which was first reflexed now brought back and sutured in position. This layer will act much as the omentum does in intestinal work. Silk has no place in renal or ureteral surgery.

The third method of removal, and one which deserves more extensive use, is by incision directly over stones which are fixed in the kidney substance or high up in the calices. With the help of the X-rays this procedure is perfectly reliable for an extensive search of the entire interior of the kidney is no longer necessary. At the Pennsylvania Hospital last winter I removed seven stones from a kidney, the stereopticon plate (made by Doctor Bowen) showing each and their relative positions. I removed two stones from the pelvis, four from a pocket in the lower pole, and the seventh from one of the calices near the convex border, making three incisions, each directly over the stones. There was no urinary leakage whatever in this case and I am sure much less damage was done to the kidney by these three short incisions than would have accompanied the splitting of the entire kidney. In a number of other cases where the stone has been located by a good skiagraph, I have used this direct incision with the greatest satisfaction to myself and I believe with the least possible danger and discomfort to the patient. Binnie (*Operative Surgery*, 1911), approving of the plan, says: "It is far less damaging to the kidney to make several clean incisions through its parenchyma and thus extract the calculi with the minimum of laceration and contusion than to endeavor to take them all out through one cut. The latter plan too often

for these the surface of the sigmoid was uniform. There was no evidence of diverticulation. At the summit of the sigmoid loop there was a necrotic area as large as the little finger nail, which extended deeply into the intestinal wall. No effort was made, of course, to see whether it communicated with the intestinal lumen, although it seemed evident that rupture was imminent. The area was inverted, fixed with a few Lambert sutures and covered with omentum. The operation was completed by the insertion of a deep-seated cigarette drain. The post-operative course was rather a stormy one. Two days after the operation there were two bloody stools. The leucocytosis gradually subsided and with it the temperature. The latter, however, did not reach normal until the eleventh day. The patient left the hospital on the twenty-first day in practically normal condition.

A second case of suppurating perisigmoiditis in an infant was referred to me by Dr. Rachford.

CASE II.—The patient, a female of nine months, had for several months suffered on and off from enterocolitis. It was a bottle-fed child. When brought to this city from its home in Lafayette, the patient was greatly emaciated and had evening temperature of 102. The stools frequent and small were occasionally blood-stained and there was always great rectal tenesmus. There had been no vomiting. The abdomen was slightly distended and in the lower left quadrant an indistinct swelling as large as a peach could be mapped out. It was very tender and seemingly fluctuating.

*Operation.*—Good Samaritan Annex, December 1, 1903, under chloroform anaesthesia, revealed no peritoneal involvement, but an abscess in the sigmoid-mesocolon. About three ounces of not fetid pus escaped. The abscess being well walled off the sigmoid was not looked for. Drainage was instituted and the patient made a slow but complete recovery.

The first of the above cases seems unique to me, for after a rather complete investigation of the literature of sigmoiditis I have found no similar case.\* Gissin,<sup>2</sup> in a report of twenty-

\* Since the above was written, I have come across a case reported by Goebel in a boy of three years in whom a rectal perforation of the sigmoid loop was successfully made (*Zentralbl. f. Chir.*, 1903, p. 211).



cases there occurred a slight outpushing of the wall of the intestine, which had somewhat the macroscopic appearance of the small diverticula seen in adults.

The examinations were made after the colons had been moderately hardened in formalin and then filled with water just sufficient to render the walls taut but not under enough pressure to stretch them.

These experiments appear to me inconclusive in view of the fact that no demonstrated case of acute diverticulitis in infancy or childhood has, to my knowledge, been recorded. Diverticula, it is true, may be almost microscopic and it is of course possible that such a diverticulum might have been the predisposing cause of the acuter symptoms which necessitated operation in Case I. In a very comprehensive and analytical article by Patel<sup>8</sup> he states, "Perhaps some day we will be enabled to state that almost all the cases described under the name of sigmoiditis are cases of diverticulitis, precisely as appendicitis little by little has been substituted for typhlitis." This inference does not seem to be justified for the one perhaps important reason, namely, that on the right side we *always* have the appendix and that on the left side the presence of a diverticulum can only be assumed until its presence is actually demonstrated by operation or autopsy.

The first case above reported seems to me conclusive that a primary inflammation may develop in the mucosa of the sigmoid, invade the deeper layers of the gut, and lead to necrosis and abscess formation without gross diverticulation as the basal factor.

In the second case there was no certainty even of the involvement of the sigmoid, although the previous history indicated some form of colic infection. In the classification of inflammatory lesions about the sigmoid based on an analysis of seventy cases, Patel classifies seventeen of them under the caption of non-suppurative sigmoiditis. All the cases recovered without operation, so that no evidence was obtained as to the exact anatomic changes which caused the tumor mass as one of the clinical symptoms. Most of these cases occurred

sible. Given a fair sized stone lodged just below the iliac vessels this operation is comparatively easy. Fenger says that extraperitoneal ureterolithotomy had been done five times when his paper was written in 1894. In four cases the stone was above the iliac vessels, in three instances near the kidney and in but one case was the stone below the vessels. In this case Twynam located the stone by opening the abdomen, which was then closed, and the operator three weeks later removed the stone through an extraperitoneal incision in the iliac region. The technic of dealing with the ureter after the removal of the stone is considered in the description of the next method of operating.

The combined intra- and extraperitoneal operation has suggested itself to many operators but in the beginning the operation was often done in two stages, the stone being located through the peritoneal incision and later removed extraperitoneally. R. B. Hall (*Medical Record*, October 18, 1890) located a stone by exploratory laparotomy, forced it up into the kidney and removed it through a lumbar incision. The combined abdominal and lumbar operation for stone in kidney had, in 1892, been done ten times with but one death by Thornton (*Manual of Operative Surgery*, 1892). To T. C. Witherspoon (*New York Medical Journal*, May 21, 1904), I believe belongs the credit of doing the first combined operation for stone in the ureter. He explored the ureter from the peritoneal side through a rectus incision, located the stone, dissected up the peritoneum until the ureter was exposed, closed the peritoneum and removed the stone extraperitoneally. In 1905, Erdmann (*ANNALS OF SURGERY*, 1905, xlivi) accidentally opened the peritoneum in doing an extraperitoneal operation and then intentionally enlarged the opening, confirmed the diagnosis, removed the appendix, and then extracted the stone extraperitoneally, while a finger in the peritoneum supported the ureter. In the same year I twice did much the same operation through a rectus (Kammerer) incision (*ANNALS OF SURGERY*, May, 1906). The operation was so easy as compared with the extraperitoneal method

lished cases in adults, I think they justify me in tentatively submitting the following conclusions.

1. Although few cases of sigmoid diverticulation have been found in children, no case of diverticulitis has been recorded in a child.

2. To designate in a general way, as is the present tendency, all left-sided lower quadrant suppurations as of diverticular origin is not warranted by the facts. Unless a diverticulum is shown, the diagnosis must be problematical. This applies, of course, very much more to children than to adults in whom all the recorded cases have occurred.

3. Left-sided appendicitis cases have been described with and without visceral transposition.

4. It has not been my object to underrate the importance of the sigmoid diverticulum as the cause of left-sided abdominal suppurations, but to call attention to other conditions notably of the mucosa producing them and particularly in children.

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<sup>1</sup> Brewer: Jour. Amer. Med. Assoc., vol. li, p. 543.

<sup>2</sup> Powers: ANNALS OF SURGERY, vol. lvi, 1912.

<sup>3</sup> Giffin: Jour. Amer. Med. Assoc., 1912, vol. lix, p. 864.

<sup>4</sup> Telling: Lancet, 1907, p. 843.

<sup>5</sup> Hartwell: Amer. Jour. Med. Sciences, vol. 140, 1910.

<sup>6</sup> Ashurst: ANNALS OF SURGERY, 1908, vol. xlvii.

<sup>7</sup> Walcha: Deutsch. Med. Wochenschr., Bd. 25, 1904, p. 1273.

<sup>8</sup> Patel: Revue de Chir., vol. 35, 1907.

<sup>9</sup> Dowd: ANNALS OF SURGERY, 1912.

<sup>10</sup> Mayor: Revue med. de la Suisse Romande, 1893, p. 421.

<sup>11</sup> Matthews: On Diseases of Rectum and Sigmoid Flexure, 1902.

<sup>12</sup> Rosenheim: Zeitschr. f. Klin. Med., 1904, bd. 54, p. 473.

<sup>13</sup> Durant: Lyon Med., vol. cxvi, p. 780.

that damage to it through rough handling is not likely. The stone can also be much more readily passed up into a healthy portion of the ureter in the combined than in the simple extraperitoneal method. The one objection to this method which can be raised, is the possible infection of the peritoneal cavity. By the exercise of certain precautions I believe this can be reduced to practically nothing. My own rule has been not to open the ureter until the stone has been thoroughly exposed and the ureter fixed in the position desired for incision; and that when the forefinger has once been removed from the peritoneal cavity it is not again inserted. When the stone is removed the sutures, if needed, should be introduced at once and the drain passed down to the ureteral opening. The peritoneum is then closed and the drain brought out at a point as distant as possible from the peritoneal wound.

In certain cases it is difficult to locate the stone, and sometimes to find the ureter by the extraperitoneal route without extensive dissection and a prolonged operation. Attention is called to Case 6, of my first series in which two stones were removed from one ureter by the combined operation and one stone from the other ureter by the extraperitoneal route in thirty minutes; and this was not the result of a habit of operating hurriedly, but rather the result of the easy access to the ureter through the described incision. I do not wish to be understood as advocating the opening of the peritoneum in every case, nor have I practised this (10 times in 14 operations), but in doubtful or difficult cases I do believe that it is a measure which will greatly facilitate the operation, and reduce its complications, especially injury to the ureter. It is unnecessary to repeat the advantages to be derived from the ability to thoroughly explore the entire urinary tract through such an opening. In two of my recent cases I have had more trouble in getting the stone up into view than in any of the others but this was due to the fact that I was dealing with a stone very near the bladder and so fixed that it could not be pushed up the ureter without damage to this organ.

When the stone is situated in the vesical portion of the

The diagnosis in these cases from the urinary findings was quite impossible, and the differential diagnosis in one of them from an empyema, was not easy.

In a fairly large experience in the surgery of the kidney I do not recall having met with a single instance of pathological conditions which resembled very closely the findings of the cases herein reported, nor at the time of operation was I cognizant of the fact that excision of the infarct had ever been attempted, and only learned of Woolsey's case in conversation with him long after my own experience.

In presenting these cases, I have no wish to submit any brief for the performance of this somewhat unique procedure of excision, but simply to present the facts of the cases in point and express the belief that in a somewhat restricted field, perhaps, the operation has a distinct place in that it is reasonably safe and fulfills the indications most admirably.

#### REPORT OF CASES.

CASE I.—Louis K., twenty-three, single, admitted to the Greenwich Hospital, Feb. 21, 1909, to the service of Dr. Hyde, to whom I am indebted for the report and for much valuable assistance. His previous and personal history were entirely negligible as regards the present illness, which began three weeks ago with a sudden attack of pain in the right side which became worse and necessitated the calling in of a physician, who made a tentative diagnosis of appendicitis and gave him some medicine which relieved his pain. He suffered considerably from dysuria, however, which became worse, and finally, three days before he came to the hospital, complete retention of urine occurred, for which catheterization had been systematically done.

On admission his chief complaint was pain in the right side, and inability to pass his urine. His general condition was fairly good and he did not seem to be very sick. His temperature was  $99.2^{\circ}$ , pulse, 80, and he showed a white blood count of 12,000. The abdomen was scaphoid, tender over the bladder but no tenderness was noticed at this time, over the region of the kidney. There was a slight urethral discharge, thought to be

## RUPTURE OF THE BLADDER.\*

WITH REPORT OF THREE UNUSUAL CASES.

BY GEORGE WOOLSEY, M.D.,  
OF NEW YORK,

Surgeon to the Bellevue Hospital; Associate Surgeon to the Presbyterian Hospital.

RUPTURE of the bladder is not a common lesion, for that reason most cases have been and should be reported. Several excellent papers, including the statistics of reported cases, have been contributed, during the past ten years, by Alexander,<sup>1</sup> Jones<sup>2</sup> and others.

Most cases are either intra- or extraperitoneal. The latter is commonly associated with fracture of the pelvis, the former is the more common variety. Rarely there may be a combination of both.

*Etiologically* the lesion is usually due to an injury to a full bladder. A number of cases are recorded where it has occurred during distention for a suprapubic cystotomy, the rectum being at the same time distended by a Peterson bag. This distention is quite unnecessary if the patient is in the Trendelenburg position.

In a very few cases the bladder was not full at the time, but had just been emptied. In such cases great violence is required, and the rupture is extraperitoneal. Routh<sup>3</sup> reported the case of a drunken man, thirty-four years old, whose bladder was ruptured extraperitoneally by a kick in the abdomen one hour after voiding.

Again there may be no external injury. Such cases are called idiopathic ruptures, and usually depend upon some pathologic condition of the bladder associated with the presence of stone, stricture of the urethra or hypertrophy of the prostate. In a bladder thus weakened, and distended,

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\* Read before the American Surgical Association, May 8, 1913.

<sup>1</sup> ANNALS OF SURGERY, XXXV, 1902, p. 106.

<sup>2</sup> ANNALS OF SURGERY, XXXVII, 1903, p. 215.

<sup>3</sup> Brit. Med. Journ., Sept. 21, 1901, p. 811.

The kidney having been freed, it was pulled out of the wound and thoroughly examined. The cortex was split longitudinally and an abscess in the upper pole was opened and drained. There was found also a considerable triangular area of soft white infarction, apparently riddled with minute abscesses, and measuring about two inches across its base and not extending into the pelvis. As the rest of the organ appeared reasonably normal and the infarcted portion of the cortex was easily enucleable with the finger, the infarct which was not very adherent, was neatly extirpated in this manner with but very trifling bleeding, and the walls of the triangular gap in the kidney looked to be covered with granulations. The kidney was returned to its pocket and the gap in the cortex was pressed together by gauze pads introduced above and below the organ. These also provided for abundant drainage of the kidney and the wound, which was loosely closed to the drains.

There was free drainage of bloody fluid with a marked urinous odor for several days and the pads of gauze were removed and replaced by smaller ones on the fifth day. No blood appeared in the urine after the operation. About five days later, the gauze was removed and rubber tube drainage instituted, which had to be retained rather long on account of pus retention in the upper pocket following attempts at early removal. By April 13, however, the tubes were all removed, the wound was nearly closed and the patient sitting up and growing stronger daily. On April 30 he was discharged with a normal temperature, his wound healed, and apparently well.

CASE II.—Peter K., twenty-three, car cleaner, Austrian, admitted to First Medical Division of Bellevue Hospital, service of Dr. Draper, Dec. 25, 1911. His family and personal history were negative. Married. No children. Denies syphilis and gonorrhœa.

Present illness began three weeks before admission with a sudden attack of pain, sharp and stabbing in character in the left side and only felt on deep inspiration and on coughing. Since onset the pain has been variable, at times almost none, sometimes very severe. One week before, his chest was strapped which relieved him very much. His appetite is poor, he sleeps fairly well, his bowels are regular.

Frieberg<sup>4</sup> reports an intraperitoneal bladder rupture in a drunken man, from overdistention, without any known outward injury. Sugetinow<sup>5</sup> reports a case of intraperitoneal rupture of the bladder due to heavy lifting. The patient felt a sudden pain, and again on the fifth day, dying on the eighth day. Sugetinow believed that the mucous and muscular coats only gave way at first and the peritoneum on the fifth day. Jones<sup>6</sup> also reports the case of a man who, soon after urinating and defecating, had severe pain across the lower abdomen, with nausea and a desire to urinate. There was no trauma and an intraperitoneal rupture was found and closed. He was alcoholic. Bolton<sup>7</sup> reported a small rupture of the bladder in a man after two days intoxication. There was no history of injury and he woke up with pain in the abdomen. This patient was examined with the finger in the bladder, and no evidence of ulceration or any pathologic condition was found to account for rupture from overdistention.

It is well known that alcoholism predisposes to rupture of the bladder by causing its rapid distention and obtunding its sensitiveness, so that the call to urinate is disregarded. The muscles of the abdominal wall, which guard the bladder from injury, are also relaxed, so that a slight blow on the abdomen is sufficient to rupture the full bladder without leaving any sign of injury and without the patient being conscious of it. In any drunken patient the occurrence of some trauma can never be excluded.

In Case II the lack of any trauma is more definitely established. This patient was also alcoholic but not a drunkard. The case was obscure from the first, trauma was denied and there was no previous trouble with the bladder or urethra. While in perfect health, 6 days before he was seen by me, a man forty-two years old was taken with nausea and vomiting,

<sup>4</sup> Virchow. Archiv., Bd. ccii, p. 268.

<sup>5</sup> Zblatt. f. Frankhtn. d. Hum. u. Sex Organ., 1900, p. 582.

<sup>6</sup> Loc. cit.

<sup>7</sup> ANNALS OF SURGERY, XXXVII, 1903, p. 438.

the upper pole of the left kidney. The kidney was then pulled into the wound and examined. There was a good sized white infarct in the upper pole of the organ, which was riddled with small abscesses. Having in mind my former experience, and as the rest of the organ appeared uninvolved, the whole area including the infarct was easily enucleated with the finger and without any considerable bleeding as the walls of the gap in the kidney appeared to be granulating, and healthy. Two catgut sutures were introduced, bringing the sides of the gap loosely together. The kidney was dropped back into its bed and gauze drainage introduced and the wound partly closed.

Pathological report on the specimen of kidney tissue: "Large white infarct with small multiple abscesses."

Patient rallied well from the operation, saline given per rectum and on the morning following, five and one-half ounces of urine were voided. This was of brick red color, cloudy, and contained fine granular casts and many white and red blood cells. During the twenty-four hours 37 ounces were passed. Temperature,  $100^{\circ}$  to  $102^{\circ}$ ; pulse 120; respirations 24.

January 4, 1912: Considerable discharge of bloody fluid from the wound.

January 10: Drains removed from the wound and replaced by smaller drains.

January 14: Wound is slowly granulating, but a small pocket below the diaphragm still discharges pus. Condition good, temperature falling below  $100^{\circ}$  in the morning, and convalescence well established.

January 28: The patient has been out of bed for past two days and is rapidly gaining. There is still some drainage from the small pocket beneath the diaphragm and the temperature has reached normal. The subsequent history is one of steady progress and recovery and discharge from the hospital in good condition on February 19, 1912.

an abnormal or pathologic bladder, although such cases of rupture are rare. The operation and subsequent cystoscopy revealed nothing abnormal in the bladder.

Rupture of the mucous and muscular layers, giving rise to a diverticulum covered by peritoneum, has been reported by Reid. In case of a previously formed diverticulum rupture of the weakened wall would require less force than is usually necessary to rupture the bladder.

In Case II the idea first to suggest itself is that there was a perforation of an ulcer, tuberculous or malignant, from within, so that it was a case of perforation rather than rupture. The cystoscope, however, failed to reveal any evidence of a diverticulum or of an ulceration, and there were no previous symptoms to suggest them. Alexander<sup>10</sup> has reported the case of a non-tuberculous abscess, following the psoas tendon, which ruptured into the bladder on the left side, and he had seen two cases of appendix abscess which opened into the bladder. According to Alexander the prognosis, in such cases, is good, except in tuberculous abscesses, and is much better when the rupture occurs from without in than in the opposite direction. In this case there was no symptom or sign of the rupture of an abscess into the bladder, no voiding of pus and no disturbance of micturition.

Speaking of spontaneous rupture from overdistention Gross says: "The mucous and muscular coats generally give way posteriorly, where the urine accumulates under the peritoneum as a kind of secondary pouch." And again the "urine may extend as high as the umbilicus and kidneys." Though we have in this case no good evidence of rupture from overdistention, the above description indicates the course the urine took.

The chief interest in Case III also concerns the etiology. There was here a history of trauma.

A man, thirty-six years old, while asleep on a fire escape, fell one story, landing on the buttocks and woke up with supra-

<sup>10</sup> Loc. cit.

130 cases, 12 times without finding any stone, and 30 times with a fatal result, while the issue in 5 cases has not been ascertained, leaving only 83 successes. Henry Morris is generally credited with and claims the first performance of this operation, though Ashhurst says "The first formal nephrotomy for the removal of renal calculus appears to have been performed by Marchetti, in the latter part of the seventeenth century." This however, if the case, does not detract from the credit due to Morris for his masterly work in this field and particularly for his earnest advocacy of nephrolithotomy before the kidney has been converted into a pus pocket.

The incision for the exposure of the kidney will probably never become uniform, nor is it necessary that it should. The straight incision along the edge of the erector spinae with oblique extension along the iliac crest is the most generally employed. The upper portion of this incision near the twelfth rib must be made cautiously in order to avoid injury of the pleura which sometimes extends below the rib. Resection of the rib, especially when exposing the left kidney, makes the operation easier but I have never found it necessary. Mayo (*ANNALS OF SURGERY*, 1912, vol. lv) advises the free exposure of the twelfth rib and the division of the quadratus and the lateral arcuate ligament which bind the rib to the transverse process of the first lumbar vertebra and says that this procedure obviates the necessity of rib resection. I have lately followed this plan and find that it renders exposure and delivery of the kidney much easier. The injury of the pleura is not a serious one if promptly repaired. A more serious mistake is the division of and failure to suture the iliohypogastric and ilioinguinal nerves. These nerves should be exposed and drawn out of the way. Having opened up the fatty capsule and exposed the kidney, the hand should be introduced and the kidney and the upper ureter carefully palpated for stone. This should be done before the delivery of the kidney, as in the latter procedure the manipulations may cause a stone to be displaced and forced into the ureter. I believe that palpation is the best means we have for finding

bladder, was felt to well up in the bottom of the pelvis. Hence similar drainage was employed with a successful result.

Thorndike<sup>14</sup> reported six cases of rupture of the bladder, in two of which the opening could not be found. The wounds were drained and both patients recovered. In extraperitoneal ruptures failure to find the rupture is more common, and I know of such a condition in an unrecorded case.

In only one of the three cases was injection of a measured quantity of fluid used to confirm the diagnosis. When followed by operation without delay there is little danger. The fluid is sterile and so is the catheter. The danger lies in the carrying in of infection from the urethra in some cases. Hence the danger is about equally great in simple catheterization. In most cases the injection is unnecessary and in a few cases it has proved unreliable. Thus Bolton<sup>15</sup> reports a case where the small intraperitoneal opening was closed by fibrin, and all the fluid injected was returned by the catheter. Also Turnure<sup>16</sup> reports the case of a 3-inch intraperitoneal rupture in a drunken man, without history of trauma, where the fluid injected was all returned by catheter.

It has been demonstrated that sterile urine does not cause peritonitis. If the urine does not have a free outlet it is liable to become decomposed in time, giving rise to irritation. In several recorded cases the occurrence of peritonitis, or peritoneal irritation, has been delayed a number of days. This indicates that the bladder and its contents are sterile.

In most cases silk has been used to suture the bladder. When silk is used it is important to avoid passing it through the mucosa. This precaution is unnecessary when plain catgut is used. Chromic catgut is strong and durable enough for the muscularis. An additional peritoneal suture of silk or catgut should be added. The Trendelenburg position is of the greatest service in suturing ruptures on the posterior surface.

The bladder may be drained by a permanent catheter, or

<sup>14</sup> Journ. of Cutaneous and Genito-Urinary Diseases, May, 1899.

<sup>15</sup> Loc. cit.

<sup>16</sup> ANNALS OF SURGERY, vol. lvi, 1912, p. 807.

McCosh and others said they had tried it, but had gone back to nephrotomy as a safer operation. I believe to-day we will agree that pyelotomy is our preference except for the removal of large branching phosphatic stones and small ones lodged high up in the calices. Where the kidney is badly infected, nephrotomy may also be preferable. Henry Morris (*Surgical Diseases of the Kidney and Ureter*, 1901), who claims to have been the first to show that wounds in the kidney substance healed quicker and with less leakage than those in the pelvis, now says (1901) that with proper suturing this is not so. The incision in the pelvis is accompanied by less bleeding when properly done than that through the kidney, gives ample opportunity for exploration and, with improved technic, heals in the majority of cases without a leak or with very little leakage. The injury to the organ itself is far less than in nephrotomy. Care must be taken to incise and reflect the layer of fatty tissue covering the pelvis as shown by W. J. Mayo (*Surg., Gyn. and Obstet.*, April, 1910), and to carefully displace any vessels which may lie in the line of the proposed incision. The incision in the tissue overlying the pelvis should not be in the same line as that in the pelvis itself and the latter should be longitudinal and not extend quite up to the parenchyma.

In opening the kidney along its back as must be done in certain cases, the pedicle must be firmly compressed between the finger and the thumb of the operator's left hand and this compression kept up until the stones are removed and the wound closed by sutures. This is the best method of controlling the rather profuse bleeding which occurs when the kidney is opened. It is unnecessary and in fact futile to attempt ligation of the bleeding vessels in the kidney substance. Catgut sutures applied closely and not tied very tightly will always stop the bleeding and will not do any serious damage to the kidney. I have never used wire for opening the kidney as recommended by Cullen and Derge, nor the transverse incision of Marwedel. Compression of the pedicle by a rubber tube or by rubber-covered forceps may be necessary when the

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The bladder may be drained by a permanent catheter, or

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<sup>15</sup> Loc. cit.

<sup>16</sup> ANNALS OF SURGERY, vol. lvi, 1912, p. 807.

results in the kidney's being converted into a ragged mass lying inside a nearly perfect capsule."

Our methods of drainage are now much simpler and much better than formerly when tubes and gauze were so freely used. The tube by pressure may do harm and should never enter the kidney or pelvic wound unless infection is very bad. The gauze drain resting against the line of suture by its capillary qualities invites leakage as has been learned by us all in intestinal and gall-bladder work. Even when it is desirable, because of pus, to drain the pelvis or kidney, a rubber-covered gauze drain is best. When no such indication is present, but the drain used as a precaution, folded rubber tissue or a small gauze wick enclosed in this material should be fixed at the site of the incision with a very small catgut suture and removed in four or five days or earlier. The fixation at the site desired is necessary as these soft rubber drains easily become displaced in the subsequent manipulations.

*Ureterolithotomy.*—I was surprised in looking up the history of this operation to find that Ricketts (*Surgery of the Ureters*, Cincinnati, 1908) and others credit Thomas, of Paris, with the first removal of a stone from the ureter in the year 1800, but on looking up the original article (*Recueil Period, de la Soc. de Med.*, 1800, viii, 216), I found that he had removed a mattress needle with incrustations from the *urethra*. Most of the early operations were done for stones lodged in the lower ureter and by the vaginal or rectal routes or else through the bladder. In 1884, Emmet operated successfully through the vagina; in 1887, Ceci removed a stone through the rectum; and in 1885, Cullingworth by the transperitoneal route. Bardenhauer, in 1882, did the first extra-peritoneal operation. Other early operators following various routes were Cabot, Twynam, Ralfe, and Godlee, Hall, Fenger, Lane, Tuffier, and Roberts. I think we may say that the operation of removing stones from the ureter became established about 1890.

The operation differs materially with the situation of the stone. One of the common sites of lodgement is within an

## SARCOMA OF THE STOMACH.\*

BY CHARLES L. SCUDDER, M.D.,

OF BOSTON, MASS.

Surgeon to the Massachusetts General Hospital.

SARCOMA of the stomach is sufficiently rare to make it important that every case be reported. I report here one case of sarcoma growing from the posterior wall of the stomach. This patient entered the medical service of Dr. F. C. Shattuck, at the Massachusetts General Hospital with what was supposed to be symptoms of duodenal ulcer. His story, however, was atypical of ulcer. The long continued indigestion, the very great weakness and pallor of the man suggested that a hemorrhage had occurred from a duodenal ulcer. The man was so thin, feeble, pale, and ill, that it seemed wise not to institute surgical treatment at first. He did not improve, but continued to have hemorrhages from the bowel and to get progressively weaker. Finally, as a last resource, a jejunostomy was done.

When the abdomen was opened in order to perform a jejunostomy a correct diagnosis of tumor of the stomach wall, probably sarcoma, was made. The man improved so rapidly in strength and general condition that subsequently it was possible to do a partial gastrectomy. The very rapid improvement in this patient's condition following the latter operation was astonishing. His appetite returned, and he gained in weight and strength.

The patient has been seen during the past year and is known to be perfectly well. I hope to be able to make a further report of the later condition of this patient.

The employment of jejunostomy under such conditions of weakness as have been outlined above is to be advocated. There are cases of chronic ulcer and cases of carcinoma in

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\* Read by title at the annual meeting of the American Surgical Association, Washington, D. C., May, 1913.

The intraperitoneal or transperitoneal removal of ureteral stones, although the easiest of all the methods, has quite obvious objections and can never be recommended as a perfectly safe procedure. John B. Roberts reported a successful transperitoneal ureterolithotomy before the Association in 1895 (*Transactions American Surgical Association*, 1895, xiii, 381). The ureter was sutured and covered with the peritoneum and there was no leakage or no infection. Lane, Kelly, and Desquin also reported early successful transperitoneal operations. Failures through leakage and infection have been reported however, and because of the likelihood of their occurrence this route can never be the one of choice. Still I believe that in certain cases it may be better to choose this method, which can be carried out with the minimum amount of traumatism to the ureter, rather than to pursue a more devious path through which one must work in the dark and do more damage to the ureter. I have never removed a stone through the peritoneal cavity but I can imagine circumstances under which it would be advisable. Bissell (*American Journal of Obstetrics*, 1908, Iviii), presents a very strong argument in favor of the intraperitoneal operation especially in women and describes a very good technic. He reports a very successful case in which the wound in the ureter was covered by a peritoneal flap which had been reflected for its exposure and an extraperitoneal drain carried by blunt dissection from the ureteral wound down into the vagina. The operation has much to commend it and I shall feel inclined in a case where the stone is low down in the female ureter to employ it.

The extraperitoneal operation done usually through a muscle splitting incision parallel with Poupart's ligament and about an inch above its outer half or through the rectus sheath, is undoubtedly the ideal one but often its difficulties are such owing, first to the fact that when the peritoneum is dissected up the ureter remains adherent to it, as was first shown by Cabot, and second to the fixation of the stone so low down in the ureter as to render its exposure to sight nearly impos-

digestion" at irregular intervals, which were associated with constipation and slight, not disabling, pain in the right lower quadrant. After eating heavy food the pain increased and shifted to the epigastrium. He had no nausea or vomiting, but raised considerable gas. About four months ago, after an exposure to cold, an attack came on which persisted. There was vomiting every few days, the vomiting coming on from one to four hours after meals, and relieving the pain for several hours. He had never tried soda for the relief of pain. The pain was not colicky or burning, and was never severe. His appetite was fair, and he was able to eat meat, eggs, milk, and gruels, but no heavy foods. His bowels were constipated, but moved daily with castor oil, salts, or enemas. He had grown steadily weaker and had done no work for three months. The last week previous to his entrance to the Hospital he had been in bed because of weakness. The night before his entrance he was taken for the first time with hot, burning pain in the epigastrium after eating rhubarb for supper. He got to sleep about midnight, but was awakened about 4 o'clock in the morning with more of the same pain and vomited about a pint of brown fluid which his doctor said was blood.

The patient had eaten nothing on the morning after the attack, and had not had much pain, but felt weaker than ever. He was not troubled with coughs, headaches, dyspnoea or oedema. A complete physical examination was not attempted, but a superficial examination showed nothing abnormal.

Blood smear: Slight achromia with polynuclear leucocytes.

May 1. White blood corpuscles, 16,000; haemoglobin, 80 per cent.

May 5. White blood corpuscles, 14,000; haemoglobin, 80 per cent.

May 10. White blood corpuscles, 16,000; haemoglobin, 75 per cent.; red blood corpuscles, 4,580,000.

The patient was given nothing by mouth or rectum for two days, and then was put on rectal feeding for three days. During this time he complained of attacks of burning and cramps in the epigastrium which kept him awake at night. The first few days these attacks sometimes terminated in vomiting large amounts of fluid with "coffee grounds" material. The guaiac test for the stool was repeatedly strongly positive.

alone, that I have continued to use it wherever the stone cannot promptly be exposed in the extraperitoneal wound. In 1908, I reported (*Surg., Gyn., and Obstet.*, May, 1908) seven operations for ureteral calculus, in five of which a small opening was made in the peritoneum, which enabled me to at once locate the stone and by pressure bring it up into the extraperitoneal wound where it was removed; in the other two operations the stone was readily located and it was unnecessary to open the peritoneum. Since the publication of the paper in which the details of my first 6 cases (one had stones in both ureters, making 7 operations) are given, I have operated on 7 cases of ureteral stone, in 5 of which the combined operation was done. This makes a total of 14 operations with 10 combined intra- and extra-peritoneal ureterolithotomies. All the patients made good and prompt recoveries. Taking the 10 cases where the peritoneum was opened, there was no peritoneal infection and leakage of urine occurred but in 3 cases, the first two and the last. The ureteral wound was closed with sutures in but 2 cases. The leakage of urine is not dependent on sutures or lack of sutures but on the amount of traumatism which the ureter receives and the kind of drain which is used. I am sure that leakage in my first 2 cases resulted because of the presence of a gauze drain in close contact with the ureteral wound and, in the last case, was due to traumatism because I had considerable trouble in getting a very low-situated stone up into view and the ureter slipped away from the supporting finger in the peritoneum, necessitating a second incision in a very inaccessible portion of the ureter. The stone could never have been removed by the usual extraperitoneal operation. The drain should be of the type already described in connection with pyelotomy.

One of the advantages of the combined method, as practised in my own 10 operations, is the ability to explore thoroughly the entire ureter on the suspected side and a large part of the ureter on the opposite side. Another advantage is the fact that it is unnecessary for exploratory purposes to separate the ureter from its surroundings to any great extent and

## CASES OF SARCOMA OF THE

## D UPON.

Name.	No.	Sex.	Age.	Kind of sarcoma.	Location in stomach.	Remarks.	Reference.
Capello	1	F.	54	Cystic	.....	Well two years later	Centralbl. f. Chir., 1899, No. 20, p. 609.
Cantwell	2	F.	52	Spindle-cell	Posterior wall	Well eight months.	ANNALS OF SURGERY, November, 1899, p. 596.
Billroth	3	..	..	Round-cell	Anterior wall	Recurrence	Wien. med. Presse, 1888, Nos. 4 and 5.
Dock	4	M.	55	Lymphosarcoma	.....	Partial gastrectomy	Journal of the American Medical Association, 1900, xxxv, 156.
Hartley	5	F.	54	Spindle-cell	Posterior wall	.....	ANNALS OF SURGERY, 1896, i, 609.
Schoop	6	F.	..	Lymphosarcoma	.....	Well one year. Gastrectomy	Centralbl. f. Chir., 1899, xx, 609.
Moschcowitz Yates-Ochsner	7	M.	50	Lymphosarcoma	Near pylorus	Well nine months	ANNALS OF SURGERY, 1912, iv, xliiv, 599.
Yates-Ochsner	8	F.	57	Large round-cell	Posterior wall	.....	ANNALS OF SURGERY, 1906, xliiv, 599.
MacCormick	9	M.	44	Spindle-cell	Posterior wall	Well four and one-half months.	Scotland Medical Journal, 1906, p. 299.
MacCormick	10	F.	53	Spindle-cell	Posterior wall	Well five months	Intercol. Med. Jour., 1903, p. 78.
MacCormick	11	M.	62	Spindle-cell	Posterior wall	Well two months.	Transactions Pathological Society, London, 1904.
Bird	12	..	..	Spindle-cell	.....	Partial gastrectomy.	British Medical Journal, 1899 and 1901.
Török (Salaman)	13	F.	21	Round-cell	.....	Lived three years and four months	Virchow's Arch., 1903, p. 156.
Morton	14	M.	39	Round-cell	Diffuse	.....	Transactions of the obstetrical Society, 1901, vol. xiii.
Miodowski	15	F.	40	Large round-cell	Posterior wall	Well two years	Mitt. a. d. Grengzeb. d. Med. u. Chir., Band xii, Heft 4.
Herman	16	F.	60	Myxofibroma	Great curv.	Died	Deutsch. med. Woch., 1903, pp. 133 and 157.
Alessandri (Salaman)	17	F.	53	Fibrosarcoma	Great curv.	.....	Deutsch. med. Woch., 1903, pp. 133 and 157.
v. Eiselsberg (Moser)	18	..	..	Fibrosarcoma	Fundus	.....	ANNALS OF SURGERY, 1910, vol. iii.
Moser	19	F.	41	Myxosarcoma	Posterior wall	.....	vol. iii.
Moser Mayland and Anderson	20	F.	17	Myxosarcoma	Lesser curv.	.....	1903,
	21	F.	57	Spindle-cell	Great curv.	Died. Well	pp. 133 and 157.

ureter in the male and in the vesical or broad ligament portion in the female, other methods than those already mentioned may be employed. The operating cystoscope has now largely supplanted the operation of opening the bladder to gain access to the stones. When the stone can be seen through the mouth of the ureter, the latter can be dilated and the stone extracted or oil injected above it. In the case of a large stone the ureteral mouth should be split until the stone can be removed. Bransford Lewis (*New York Medical Journal*, November 16, 1912), urges the use of the operating cystoscope even where the stone is fairly high in the ureter. He devotes considerable space to the dangers of ureterolithotomy and reports but one case where he has actually demonstrated the removal of a ureteral stone with ureteral instruments. The operating cystoscope is as useful as he implies but it too has its limitations and dangers.

In the female, stones which lie in the broad ligament portion of the ureter can be removed by direct incision through the vaginal wall or by the combined peritoneal and vaginal operation of Bissell, or by the Doyen (*Morris, Surgical Dispensary of Kidney and Ureter*, London, 1901, ii, 530), or the Garceau (*Jour. Amer. Med. Assoc.*, 1907, xlix), vaginal operations. Apparently urinary leakage is quite common after the vaginal operation and it is probably due to the incision being in the floor of the ureter.

CASES OF SARCOMA OF THE STOMACH  
UPON.

Name.	No.	Sex.	Age.	Kind of sarcoma.	Location in stomach.	Remarks.	Reference.
Capello	1	F.	54	Cystic	.....	Well two years later	Centralbl. f. Chir., 1899, No. 20, p. 609.
Cantwell	2	F.	52	Spindle-cell	Posterior wall	Well eight months.	ANNALS OF SURGERY, November, 1899, p. 596.
Billroth	3	..	..	Round-cell	Anterior wall	Recurrence .....	Wien. med. Presse, 1888, Nos. 4 and 5.
Dock	4	M.	55	Lymphosarcoma	.....	Partial gastrectomy	Journal of the American Medical Association, 1900, XXXV, 156.
Hartley	5	F.	54	Spindle-cell	Posterior wall	.....	ANNALS OF SURGERY, 1896, i, 609.
Schopf	6	F.	..	Lymphosarcoma	.....	Well one year. Gastrectomy	Centralbl. f. Chir., 1899, xx, 609.
Moschkowitz	7	M.	50	Lymphosarcoma	Near pylorus	Well nine months	ANNALS OF SURGERY, 1912, iv.
Yates-Ochsner	8	F.	57	Large round-cell	Posterior wall	.....	ANNALS OF SURGERY, 1906, xliiv, 599.
Yates-Ochsner	9	M.	44	Spindle-cell	Posterior wall	Well four and one-half months.	Scotland Medical Journal, 1906, p. 299.
MacCormick	10	F.	53	Spindle-cell	Posterior wall	Well five months.	Intercol. Med. Jour., 1903, p. 78.
MacCormick	11	M.	62	Spindle-cell	Posterior wall	Well two months.	Transactions Pathological Society, London, 1904.
Bird	12	..	..	Spindle-cell	.....	Partial gastrectomy. Lived three years and four months	British Medical Journal, 1899 and 1901.
Török (Salaman)	13	F.	21	Round-cell	.....	.....	Virchow's Arch., 1903, p. 156.
Morton	14	M.	39	Round-cell	Diffuse	Well two years	Transactions of the obstetrical Society, 1901, vol. xliii.
Miodowski	15	F.	40	Large round-cell	Posterior wall	Died	Mitt. a. d. Grengzeb. d. Med. u. Chir., Band xii, Heft 4.
Herman	16	F.	60	Myxofibroma	Great curv.	.....	Deutsch. med. Woch., 1903, pp. 133 and 157.
Alessandri (Salaman)	17	F.	53	Fibrosarcoma	Great curv.	.....	Deutsch. med. Woch., 1903, pp. 133 and 157.
v. Eiseisberg (Moser)	18	..	..	Fibrosarcoma	Fundus	.....	ANNALS OF SURGERY, 1910, vol. iii.
Moser	19	F.	41	Myxosarcoma	Posterior wall	.....	vol. iii.
Moser Mayland and Anderson	20	F.	57	Myxosarcoma	Lesser curv.	.....	.....
	21	F.	57	Spindle-cell	Great curv.	Died.	.....
						Well	.....

violent muscular effort, especially violent attempts to empty the bladder, may cause its rupture.

Apart from such predisposing conditions idiopathic rupture is rare.

The first case that I report was apparently an idiopathic rupture, without such predisposing conditions.

The patient, a single man, thirty-one years old, was alcoholic and on the previous evening, while bowling, was said to have drunk over a quart of champagne, besides beer. He said that he urinated at midnight and that at about 4 A.M. he was seized with a violent paroxysmal pain in the abdomen, which proved to be due to an intraperitoneal rupture of the bladder, low down on the posterior surface. When I saw him the next day the abdomen was much distended, rigid and tender. He had been twice catheterized and very bloody urine withdrawn. There were no history or signs of trauma, and he consistently denied having had any. The possibility of some trauma, which passed unnoticed on account of the effects of the alcohol, should be considered. But when he returned home, shortly after midnight, he had just voided, so that the supposition that he ran against the newel post, or some such thing, is not a likely explanation, as the bladder was not then distended. Moreover the pain did not come on until 4 A.M. The rupture probably occurred then for it is usually though not invariably followed at once by pain, and often by shock, in intraperitoneal ruptures. A few cases, however, are reported where the symptoms have been delayed for many hours or even days, and in patients under the influence of alcohol the shock may be lacking. Under the conditions present in this case we cannot arbitrarily assume that there was a trauma, but must admit that it was possibly an idiopathic rupture, due to rapid distention, on account of alcoholic excess.

As rupture may occur from violent muscular action of the bladder and the abdominal walls, we may admit the possibility of such a contributing cause, for the bladder wall felt and appeared healthy and distention alone in so short a time is not likely to have caused the rupture.

## THE SURGICAL ASPECTS OF PURPURA.\*

BY JAMES F. MITCHELL, M.D.,  
OF WASHINGTON, D. C.

IN the consideration of factors of safety in surgical operations, hemorrhagic tendency on the part of the patient deserves a place of high importance. This tendency may be inherited, natural or acquired; the three chief groups into which pathological hemorrhages fall being hæmophilia, purpuric conditions and those associated with obstructions of the bile ducts.

Hæmophilia is defined as a strange anomaly characterized by often uncontrollable bleeding. The condition may be acquired but is usually congenital. It has been said to be the most hereditary of the hereditary diseases and we are all familiar with those bleeder families in which the tendency can be traced for generations. The mode of transmission and the pathology are both interesting; but the chief surgical importance lies in the fact that in the presence of such a history even the slightest operations should be strictly avoided. When an operation upon such an individual becomes imperative, it should be undertaken only with a thorough understanding of its dangers and after the institution of every possible precaution against bleeding. Among such precautions may be considered the pre-operative administration of calcium salts and foreign serum, painstaking haemostasis and accurate coaptation of tissues during the operation and firm pressure with careful bandaging after the operation.

In icteric conditions practically the same advice may be given; for death may result from uncontrollable oozing where no vessel of any size can be detected.

Purpura, on the other hand, offers a greater surgical in-

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\* Read before the American Surgical Association, May 8, 1913.

and the next morning with pain and tenderness in the right lower quadrant. Urination was normal. As he had had two previous attacks of pain in the right lower quadrant, with vomiting, etc., the diagnosis of appendicitis was made. When seen by me he was very septic and weak, in wretched condition, stuporous, and hiccuping continuously. The abdomen was distended and held quiet, and there was a large tender mass in the right lower quadrant. At the operation a very large quantity of ammoniacal purulent urine was found retroperitoneally, extending up behind the kidney and down into the pelvis. The appendix was normal. Subsequently the X-ray revealed no stone and tuberculin tests were negative, so that the usual causes of ulceration and perforation of the kidney pelvis and ureter were absent. Moreover, the urine remained alkaline and, for a time, the greater part of the total urine came from the incision, leaving only 5 to 8 ounces to be voided.

This pointed to a lesion of the bladder and on cystoscopy there was seen behind the right ureter mouth, a crevice extending laterally nearly across the bladder floor. It resembled a "healing scar, as if a rupture might have occurred here." In about three weeks the discharge of urine from the wound ceased, and a later cystoscopy showed the crevice left by the rupture, much shorter.

He made a slow convalescence and is now, two and a half years later, better than he has been for years.

These two cases are of interest in their bearing on the principle, emphasized by Naumann<sup>8</sup> and others, that a normal bladder never ruptures spontaneously, but that such a rupture depends upon pathologic changes in the bladder wall. In Case II we can not exclude the possibility of a pathologic bladder, in Case I, of some trauma. In the case of a man of fifty-five years, reported by Hosemann,<sup>9</sup> who was seized in the night with severe abdominal pain, operation revealed a small intraperitoneal rupture of the bladder. Trauma, drunkenness and overdistention were excluded, hence he assumes

<sup>8</sup> Zblatt. f. Chir., 1911, p. 1344.

<sup>9</sup> Zblatt. f. Chir., 1912, p. 1323.

the underlying structures. No other purpuric spots are to be found." After this her temperature gradually subsided and was normal for a few days. It then rose again and a definite Widal reaction was obtained by Dr. Russell. She ran a mild course of typhoid fever. The hemorrhagic area sloughed through the thickness of the skin and healed by granulation.

Gangrene in purpuric areas is rare but may occur, as in a case reported by Prentiss, in which a portion of the anterior abdominal wall, the site of hemorrhage, sloughed away. And in Lett's case there was sloughing of purpuric areas on the face, scrotum and other parts.

It is maintained by some that there is no such thing as the disease, purpura, or in other words that it is always a symptom. Nevertheless several forms of the disease are generally recognized, exhibiting different grades of intensity; but all characterized by the special feature of spontaneous hemorrhage into the skin or mucous membranes. There is also close association with urticaria, erythema and angioneurotic œdema; Osler describing them collectively as the erythema group of skin diseases. The cause of the disease is unknown, nor has it been decided whether the primary change is in the blood-vessels or in the blood itself. Infectious origin has also been claimed. Post-mortem examinations have shown hemorrhages into the mucous membranes and other regions, but nothing to throw any light on the intrinsic cause. The characteristic lesion is hemorrhage into the skin, varying in size, usually round and sometimes covering large areas through the confluence of several hemorrhages. The fresh spots are bright red but soon become purple in color and do not disappear on pressure. The color gradually changes as in an ordinary bruise and finally disappears, leaving no trace. The eruption is more common on the extremities, particularly the legs, and is more marked on the extensor surfaces. When combined with œdema the patches are elevated.

Without attempting to go into etiology or classification, it suffices to state that one variety, known as Henoch's pur-

pubic pain and a desire to urinate. On operation an extraperitoneal rupture was found a little to the left of the middle line. There was no fracture of the pelvis.

Deaver,<sup>11</sup> has reported a case, also walking in his sleep, who fell two stories, landing on the buttocks, and had an extraperitoneal rupture of the bladder, without fracture of the pelvis.

Ashurst<sup>12</sup> states that the rupture is sometimes caused by counterstroke, as by a fall on the buttocks. My patient drank two glasses of beer before going to sleep, and the bladder was full at the time of the fall. Whether the bladder is burst by the hydraulic pressure from within, which, when the fall is suddenly stopped, expands the bladder in planes at right angles to the vertical axis at the time of the fall, or whether a sudden muscular spasm is produced by the fall, is an open question. There was no direct blow on the bladder in this case, but the mechanism is much the same as in most of those where there is a direct blow over the bladder, without pelvic fracture, i.e., an expanding of the bladder in one plane and a contraction or flattening in the plane at right angles to this.

Another interesting feature in this case was that though the principal rupture was apparently altogether extraperitoneal, there was considerable bloody fluid with a urinous odor in the peritoneal cavity. Also after an injection into the bladder, by the house surgeon, of 6 ounces of saline solution, of which only 3 ounces returned, the dulness, previously noted in the left flank and the left lower quadrant, was noticed to be shifting. On careful examination of the pelvis, in the Trendelenburg position, no intraperitoneal rupture of the bladder and no tear of the peritoneum could be found, though some fluid could be seen beneath the peritoneum. There was, however, what looked like a contusion, with ecchymosis beneath it, on the posterior surface of the bladder. On account of the fluid in the peritoneal cavity a drain was left in the rectovesical pouch, as well as in the prevesical space. The patient made a good recovery.

Kerr<sup>13</sup> reports a case of intraperitoneal rupture in which he was unable to find the rupture, though boric acid solution, injected into the

<sup>11</sup> ANNALS OF SURGERY, xxix, 1896, p. 751.

<sup>12</sup> ANNALS OF SURGERY, xxxiii, 1898, p. 385.

<sup>13</sup> ANNALS OF SURGERY, xxiii, 1893, p. 647.

the fact that the abdominal symptoms may be so striking as to lead one to open the abdomen, and Pratt states that the literature shows at least six patients who have been subjected to an exploratory laparotomy under this illusion. Quoting Osler, he states that "in children with colic the greatest care should be taken to get a full history which may bring out previous attacks either of skin lesions, of arthritis, or of intestinal crises; and secondly to make a most careful inspection of the skin for angioneurotic œdema, purpura, or erythema," and says that "with the exception of one case in which intussusception was found at autopsy, recovery from the colic has occurred in every instance." Osler himself goes further in saying that "it is also to be borne in mind that recurring colic may be for many years the sole feature of this remarkable disease. The colic is the most constant of the visceral manifestations occurring in 25 of my 29 cases. So far as I know it is never dangerous. In no case has death resulted, I believe, from intestinal causes."

I have personally seen several cases in which the diagnosis has been confusing and one in which an actual laparotomy was done under the diagnosis of appendicitis.

CASE II.—On March 28, 1899, a little girl, aged seven years, was sent into Johns Hopkins Hospital by an excellent physician, with a diagnosis of appendicitis with spreading peritonitis. Two weeks before she had been successfully vaccinated, since which time she had been indisposed with enlargement of the axillary glands, slight fever and loss of appetite. On Friday last, to-day being Tuesday, the left leg became swollen and painful from the knee to the ankle. This subsided in twenty-four hours. On Saturday morning she complained of intense pain in the abdomen about the navel, more on the right side than on the left. There was vomiting from Saturday until to-day. The vomitus was foul and on one occasion dark as if containing blood. The urine was negative. The bowels moved Saturday with salts and have moved since with no trace of blood. There has been fever and rapid pulse. Examination at the time of admission showed the temperature  $100.2^{\circ}$ ; pulse, 126; respiration, 33; leucocytes, 25,000; face flushed; tongue clean; abdomen



been ill for a couple of days with acute abdominal colic, slight fever and vomiting. There was general abdominal tenderness and rigidity, most marked however in the right iliac region. The symptoms were so suggestive of a mild appendicular attack that Dr. Crook operated and through a McBurney incision removed the appendix. I saw the boy in consultation three days later, Dr. Crook stating that his colic had not been relieved by the operation and that the findings in the appendix at operation did not seem enough to explain his symptoms. "At operation the appendix was congested and its superficial vessels distended. Inspection of the last two feet of the ileum showed that it also presented the same appearance and that the Peyer's patches all seemed enlarged, dark in color and projecting from the surface of the bowel, much resembling the condition seen in typhoid fever." There was no recollection of actual hemorrhage into the peritoneum or viscera, although the whole peritoneum was congested. Examination at this time showed slight abdominal distention with no actual spasm and no sign of peritonitis. The legs were covered with purpuric spots, especially marked on the extensor surfaces, all of small size. There were no spots on the arms or trunk and there was no joint tenderness. A diagnosis of Henoch's purpura was made and the condition cleared up rapidly.

In this case the most striking abdominal finding was the appearance of the lower ileum, and it seems quite possible that, with such a hemorrhage or oedematous condition of the Peyer's patches, there may have been at some point enough swelling of the bowel wall to cause a local paralysis which is equivalent to a local obstruction. With such an obstruction the increased peristalsis of the intestines endeavoring to overcome it would be quite sufficient to cause colic by dragging on the mesentery. Jacobsen had a similar instance in which a hemorrhagic appendix was removed.

During the last two years I have had under observation at intervals a most striking case, which I cannot class as a true Henoch's purpura, but it is certainly a closely allied condition; and on several occasions the symptoms have been so alarming as to suggest the possibility of operative interference.

intussusception, grangrene, perforation, peritonitis and death; and from the data obtained on the operating table a clear picture of the pathology can be drawn and the abdominal symptoms readily explained. In the cases of Crook and Burrow there was nothing more than congestion with localized small hemorrhages in the lower portion of the ileum. In the case of Harrington there was a definite ring of œdema in the lower portion of the ileum, causing a local paralysis equivalent to a local obstruction. We can thus readily explain the paroxysmal abdominal pain caused by the intestine attempting to overcome this obstruction and dragging on its mesentery with each contraction. Cook and Mills both saw several similar œdematos rings at intervals along the ileum. Greig suspected intussusception in his case and felt a tumor before operation, but when the abdomen was opened and the tumor delivered it proved to be a great congestion of the lower end of the ileum projecting, as a collar, into the cæcum without obliteration of the lumen.

Intussusception is by far the most frequent and most serious intestinal complication and each step in its production can be seen in the various lesions described in operative reports. It is most often ileocæcal or may be enteric. Numerous cases have been treated by operation either by reduction or resection and Vierhuff reports an instance of one which sloughed and was passed per anum, the patient recovering. Sutherland describes one case operated on for a supposed intussusception and a second in which an unsuspected ileo-cæcal invagination became gangrenous and its perforation resulted in peritonitis and death.

Nobécourt reports one instance of perforation of the duodenum 15 cm. from the pylorus and Silberman a death from gastric perforation. Aside from these two isolated accidents, lesions seem to be pretty constantly confined to the lower ileum.

In a by-no-means exhaustive review of the literature, I find 19 instances in which laparotomy was performed. Eleven times nothing was found which demanded operation and in

which the employment of jejunostomy as a temporary measure is wise. Jejunostomy under these conditions may make a subsequent operation possible, when if a radical operation were attempted without the preliminary jejunostomy the patient might die.

I have collected all cases of sarcoma of the stomach in readily accessible literature which have been operated upon. In a study of these cases of sarcoma of the stomach certain facts are of interest. The tumor starts usually from the submucosa or muscularis. The mucosa is involved in the disease rather late. The disease is *one of young and middle adult life*. The posterior wall of the stomach and the greater curvature are most often involved. The orifices of the stomach, cardia, and pylorus are rarely involved. Various cell types of sarcoma are found. Spindle-cell sarcoma is quite common. The tumor may be small or reach even twelve pounds in weight. The growth is rarely secondary. It is ordinarily primary in the stomach. The growth extends either outward into the free abdominal cavity or into the lumen of the stomach as in the case here recorded. There is an absence of cachexia in far advanced cases of this disease; quite a different picture from that of carcinoma.

In the absence of metastases a radical operation appears to hold out even better chances of cure than in carcinoma.

I have appended the bibliography that has seemed to be pertinent to the subject under discussion.

CASE.—J. H. P., a Swede, aged twenty-nine years, occupation a composition floor-layer, entered the Massachusetts General Hospital on May 1, 1912. He was a private patient of Dr. W. W. Harvey, of Roxbury. His family history was excellent, his father, seven brothers, and one sister being alive and well. His mother was living but had some stomach trouble. The patient had always been strong and well excepting for an attack of typhoid fever "long ago." He chewed 35 cents' worth of tobacco a week. There was no history of venereal disease.

For about two years previous to the patient's entrance to the Hospital he had been troubled with frequent attacks of "in-

could be attributed to the operation. The recovery rate where intussusception was found—8 cases with 6 recoveries—is as good as occurs with intussusception from other conditions.

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On the sixth day he was put on first stage gastric ulcer diet and kept on this diet for three days. Each day early in the evening he had an attack of pain and vomited one-third of a basin full of milk, mucus and crackers, almost all he had taken during the day. On the ninth day he was given milk and crackers every half hour, but vomited as before. Visible peristalsis was noted in the right epigastrium. A diagnosis of obstruction at the pylorus was made and an immediate exploratory operation was advised.

At the operation on May 10, a sarcomatous tumor, the size of a closed fist, was found on the posterior wall of the stomach projecting into the stomach cavity. The tumor was rather discrete and showed no thickening about it. There were no definite glands. A jejunostomy was done.

The patient recovered well from the operation and grew stronger, but still vomited frequently at night. On June 25, he was still doing well and had gained sufficient strength to permit of the removal of the tumor.

On June 26, a second operation was done, a partial gastrectomy for the removal of the tumor of the stomach, the jejunostomy being untouched. On June 29, the jejunostomy was disconnected, the jejunal fistula closed, and an anterior gastro-enterostomy was done at a point a little distal to the situation of the jejunal opening. Following this operation the patient made an excellent recovery. There was no vomiting and the wound healed rapidly. He was discharged from the Hospital on July 26, 1912.

In December, 1912, the patient reported for examination and appeared to be in perfect health. He weighed 160 pounds, having gained 70 pounds since he left the hospital. He was working regularly as a composition floor-layer eight hours a day. On April 1, 1913, he was reported to be perfectly well.

The pathological report upon the tumor removed on June 26 was as follows:

"Specimen consists of a solid tumor of the stomach, circular, and resembling a doughnut in shape, measuring 4 and 6 cm., with its centre filled with a polypoid mass projecting above the periphery of the tumor. Its surface is smooth, and on section it is grayish white and homogeneous, with spots which are yellowish. There is a wide margin of gastric wall at one end while at the other the free mucous surface is only 5 to 6 cm.

partially paralyzed limb, extending from the left hip down into the leg—worse in the calf and ankle; she also had marked distress in the rectum. Her temperature and pulse were normal. She was able to get out of bed on the ninth day. About six weeks after her confinement, she had seyere pain and a sense of pressure in the lower left pelvis, which was increased by walking or being on her feet for any length of time. About this time she noticed a sense of pulsation in the region of her left hip. The pelvic distress and pulsation steadily increased in spite of local treatment up to the time of her operation.

*Physical Examination.*—A well-nourished young woman, aged eighteen years; five feet in height; weight 130 pounds; abdomen and chest normal; atrophied left leg, all muscles weak, but able to walk with a dragging limp. Her reflexes were otherwise normal; Wassermann negative; examination of urine and blood normal. Pelvic examination showed laceration of cervix; uterus normal in size, motility and position, except that it was pushed to the right side of the pelvis by a hard tumor in the posterior portion of the left pelvic cavity. There was a marked impulse in the tumor with each heart beat. With one finger in the rectum and one in the vagina, the pulsation was markedly expansile in character; compressing the abdominal aorta stopped the pulsation in the tumor.

At the end of a month's observation and about six months after her child was born, when it was seen that the aneurism was increasing in size I determined to operate, hoping that I could obliterate the sac, after the plan suggested by Matas. A transverse Pfannenstiel incision was made with the belief that through such an opening one could more easily reach deep into the pelvis. But this was disappointing for I could not at any time during the operation see even a small portion of sac wall. The common iliac was followed to its point of division and the posterior iliac was tied by the sense of touch, with heavy catgut. When the ligature was tightened the pulsation entirely disappeared in the tumor. This operation was done in November, one and a half years ago. She still has a hard indurated tumor almost as large as before her operation, with a very slight pulsation in it, almost as though it were transmitted. This tumor causes her some pain in her left hip, but as she thinks it is decreasing, I have not advised her to have any further operation.



that the same condition was apt to obtain in places where there are broad tissue planes, as in the neck and abdominal wall.

DR. T. A. McGRAW, of Detroit, cited a case of pyloric obstruction caused by a tumor the size of a hen's egg, the condition being relieved by a gastro-enterostomy with the elastic ligature, the patient living in perfect health for three years. At the end of that time he again developed intestinal obstruction. Operation revealed no adhesions around the stomach, no trace of the original tumor at the pylorus, no palpable glands, but a cancer of the large intestine immediately under the stomach though not in any way connected with this viscus. The patient succumbed to the operation and examination of the sections showed typical scirrhus carcinoma, with cheesy degeneration of the lymphatic glands.

DR. HOWARD LILIENTHAL, of New York, referred to the two-stage operation for pylorectomy, first a gastro-enterostomy and then two weeks later a pylorectomy, stating that he was convinced that in at least two instances by following this procedure he had saved the patient from the necessity of the second operation. He therefore recommended that in performing operations for the relief of pyloric obstruction where there are no distinct metastases, the two-stage method be followed.

DR. J. M. T. FINNEY, of Baltimore, stated that he had operated on cases of fibromatosis, doing simply an exploration or a palliative gastro-enterostomy, with the recovery of the patient and the disappearance of the tumor. He also cited a case of spontaneous cure without operation.

DR. CHARLES N. DOWD, of New York, referred to a case of perforated gastric ulcer in which it was impossible to do a gastro-enterostomy because of the excessive infiltration, but in which two weeks later the infiltration had entirely disappeared. He mentioned a case treated by the two-stage operation, a big tumor being found at the first, and its disappearance at the second, but notwithstanding this the patient died of cancer.

DR. GEORGE W. CRILE, of Cleveland, reported a case in which he performed a gastro-enterostomy for supposed cancerous condition, but which later proved to be syphilitic.

DR. RUDOLPH MATAS, of New Orleans, stated that simple fibromatosis of diffuse type was a very rare condition. He also called attention to the fact that in the pathology of elephantiasis,

terest because of its many variations, the widely different symptoms which it presents, the possibility of confusion in diagnosis and certain complications which may demand operation. The term purpura was first applied by the ancients to the eruptions of scarlet fever and measles as well as to hemorrhage into the skin; but has been restricted to spontaneous hemorrhages in the skin and mucous membranes. It represents both a symptom and a disease, and has been referred to by Osler as "That obscure and interesting manifestation of which we know so much and at the same time so little." In distinction from haemophilia the hemorrhagic tendency is acquired and usually transitory.

As a symptom, purpura may appear in haemophilia or in scurvy, the three conditions thus in many ways bearing a resemblance. It may occur in any infectious disease and in many other conditions. As a result of the administration of certain drugs, in nervous conditions and from mechanical strain, the eruption is sometimes seen.

A recent case seen in consultation with Doctors Behrend and Reede, which serves as a stimulus for this report, is an example of symptomatic purpura.

CASE I.—A strong, healthy girl, aged fourteen years, nine days ago began to limp and complain of pain in the right hip. The following day she felt chilly, but on the next was able to go to school. On the fifth day of her illness she was seen by Dr. Reede, who found her temperature  $103^{\circ}$ , marked tenderness in the right iliac fossa, sensitiveness over the whole abdomen and looseness of the bowels. On the sixth day she was brought to the hospital and has remained in about the same condition. Because of the possibility of deep-seated bone infection a surgical opinion was desired. Her temperature when seen at the hospital was  $104^{\circ}$ , leucocytes, 13,300. Examination of the chest and abdomen was negative except for abdominal tenderness. Over the great trochanter of the right femur is an area about 6 cm. in diameter, distinctly hemorrhagic, dark purple in color, with a surrounding margin of oedema about 1 cm. wide. This area is slightly tender, elevated above the general level of the skin and is entirely limited to the skin, which can be moved over

time is required where there is a large amount of callus, as in incomplete reductions. He also believed that immobilization did not cause ankylosis but that lack of reduction did.

DR. GEORGE E. ARMSTRONG, of Montreal, referred to the conclusion of the British Medical Association that the functional result in fractures is very largely dependent upon the anatomical result. He stated that there was but a slight tendency on the part of fractures to displacement after being once properly replaced, and stated that while in many cases the use of a foreign body was objectionable, his method of notching the ends of the bones even in spiral or oblique fractures would hold them in accurate position. He also said that in two cases he had made a dowel from a small portion of the crest of the tibia, inserting this into the medullary canal of the upper and lower fragments of the broken bone, and that this piece of living bone had done much to stimulate and increase repair.

DR. WILLY MEYER, of New York, called attention to the treatment of fractures of the elbow-joint proposed some fifty years ago by William Busch, who insisted that if the elbow be placed in three positions stiffness would not result. First, in the obtuse position in which the patient usually holds the arm when he presents himself for treatment, for ten days; then with a whiff of anæsthetic, conducting the arm slowly to the sharp right-angle position, keeping it there for ten days; finally, with another whiff of anæsthetic very slowly bringing it into the straight position with a splint on either side encased in a flannel bandage. He has had most satisfactory results with this treatment.

DR. HENRY B. DELATOUR, of Brooklyn, reported that in the last nine years he had had 78 fractures of the patella, all operated, with mortality of one; this was due to delirium tremens. Two cases of simultaneous fracture of both patellæ; in one case one patella operated on, then 12 days later the other patella: in the other case both operated upon at the same time. Method of operation employed was suture with chromicized catgut, particular attention being paid to the tear in the ligament. No drainage. Plaster splints from toes to middle of thigh for 10 days, then division of splint to leave a posterior splint, patella moved laterally at this dressing when the sutures are removed, and the posterior splint retained for three weeks; then removed at night, or in daytime, thus allowing the patient some passive motion in bed without any strain directly on the patella. No movements of

terest because of its many variations, the widely different symptoms which it presents, the possibility of confusion in diagnosis and certain complications which may demand operation. The term purpura was first applied by the ancients to the eruptions of scarlet fever and measles as well as to hemorrhage into the skin; but has been restricted to spontaneous hemorrhages in the skin and mucous membranes. It represents both a symptom and a disease, and has been referred to by Osler as "That obscure and interesting manifestation of which we know so much and at the same time so little." In distinction from haemophilia the hemorrhagic tendency is acquired and usually transitory.

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tuberosity in one or two long bones which had been diagnosed as sprains of the knee or rupture of the internal lateral ligament; in the latter case, that of rupture of the ligament, a fracture of greater or less extent should be considered present until absolutely disproved.

#### ANALYSIS AND STUDY OF 724 MAJOR AMPUTATIONS.

DR. WILLIAM LAWRENCE ESTES, of South Bethlehem, Pa., read a paper with the above title, for which see page 39.

DR. NATHAN JACOBSON, of Syracuse, considered that as most of the patients enter the hospital in a depleted condition one should promptly overcome that condition by intravenous saline transfusion and overcome shock by early operation. As to amputating through the knee-joint as advocated by the author, he preferred amputation through the upper third of the leg in order to save the knee-joint wherever possible. He reported two cases, one of quadruple amputation necessitated by a roller accident; the other of triple amputation due to contact with a live wire.

DR. HOWARD LILIENTHAL, of New York, stated that in his experience in cases of gangrene due to arterial disease amputation at the knee-joint had been found wanting, gangrene because of deficient blood supply to the flaps being not uncommon: he preferred amputation in either the upper part of the limb or in the lower part of the femur. He stated also that it had been his habit for some years to make skin and muscle flaps rather than flaps of skin alone, in order to retain the nutritional supply, and that this being impossible about the knee, was another argument against selecting this point for amputation.

DR. WILLIAM S. HALSTED, of Baltimore, advocated that when a patient was greatly shocked from loss of blood and it is not possible to do a transfusion, much benefit may be obtained by catching all oozing points with clamps and placing the patient in a warm bath. With reference to hip-joint amputations he said he had never seen a death from this operation and attributed this to the fact that the patient is in good condition before operation and no Wyeth pins are used, the operation being made absolutely bloodless by the use of clamps.

DR. F. W. PARHAM, of New Orleans, advocated the advantage in some instances of using spinal anæsthesia, stating that he had resorted to this method in several cases with good results.

DR. ALEXIS THOMSON, of Edinburgh, suggested the advi-

pura, is most interesting from a surgical standpoint. Attention was first called to this form by Henoch in 1874, though a case had been previously reported. It is characterized by recurrent attacks of purpura and crises of abdominal pain, often accompanied by vomiting and diarrhoea and with arthritic pain and swelling. It is relatively more common in childhood, but may occur in adults. It may begin with rheumatic pains and swelling of the joints and be followed by purpura and colic with vomiting and blood in the stools; or gastro-intestinal symptoms may appear first and purpura and joint conditions follow. Recurrence is characteristic. Fever is usually mild and there is ordinarily a slight leucocytosis. Epistaxis, haematuria, and haemoptysis often occur. The purpuric rash usually comes after the other symptoms and is often unnoticed. The abdominal symptoms having once appeared usually dominate the scene. The pain is colicky in character; does not yield to treatment, and may continue for a number of days. The colic is intense. The abdomen is usually rigid and tender. In the beginning the tenderness is diffuse; but may become localized over some particular area, usually the right lower abdomen, thus suggesting appendicitis. Vomiting is often distressing and constipation stubborn, suggesting intestinal obstruction. The prognosis is ordinarily good, although Pratt reports eight deaths in a combined series of 202 cases. The explanation of the abdominal symptoms, on the basis of autopsy data, is not clear. In view of the findings of Lennander, as to the insensibility of the abdominal viscera and the extreme sensitiveness of the parietal peritoneum, it is clear that simple hemorrhage into the mucous membranes or localized oedema of the intestines would not be a satisfactory explanation, unless these changes should be sufficient to offer an obstruction to the fecal current. With such an obstruction present the explanation would be simple, for we would then have the same dragging on the parietal peritoneum through the mesentery as occurs in obstructions from kinks, bands, adhesions, etc.

The importance of the condition, surgically, then lies in

incision the narrow part of the capsule is reached and freely cut, and then, in the great majority of cases, in children of proper age, the head can be easily lifted into the acetabulum. Later, to prevent a reluxation, an osteotomy of the femoral shaft is done below the trochanters, and the lower fragment is rotated outward while the upper fragment is held in such a position that the head and neck are properly correlated to the acetabulum as well as to the rotated out shaft. The method of holding the upper fragment, consisting of head, neck and trochanters, is by driving into the shaft, between the trochanters, a suitable steel nail the end of which projects and can be incorporated in the plaster-of-Paris dressing. The method of estimating the functional value of the head and neck and the presence or absence of the antetorsion of the shaft of the femur by radiograms is given, and the character and time of use of plaster-of-Paris splints. The osteotomy is accorded a place of considerable value, for the cases of satisfactory joints, that is, joints that are practically normal functionally, even though they varied from the conventional norm anatomically, was but 41.3 per cent. before the osteotomy became a part of the technic, while 70.3 per cent. of satisfactory joints are secured since the osteotomy is practised in all cases that need it.

DR. WILLIAM S. HALSTED, of Baltimore, reported a case of a patient operated upon at the age of five years in which he encountered a very small head and a twist of the neck of the femur which made extreme rotation necessary to hold the joint in position, the slightest deviation from this permitting popping out of the head. This child was kept in this position with extreme rotation, the splint being changed every week, for about six months, and now, some twenty years later there is a perfect development of the hip.

#### THE SURGERY OF THE CARDIOVASCULAR SYSTEM.

Papers were read as follows:

By DR. FRANCIS T. STEWART, of Philadelphia, entitled: Five Cases of Suture of the Heart; by DR. WILLY MEYER, of New York, entitled: The Surgery of the Pulmonary Artery; by DR. GEORGE TULLY VAUGHAN, of Washington, entitled: Aneurisms Treated by the Matas method; by DR. LEONARD FREEMAN, of Denver, entitled: Arteriovenous Anastomosis in Threatened Gangrene of the Foot; by DR. RUDOLPH MATAS, of New Orleans,

slightly distended and rigid, but abdominal respiratory movements present. There was slight abdominal tenderness, more marked on the right side, but deep palpation was everywhere possible and there was no mass, no dulness and no actual spasm. Over both knees and elbows were numerous purpuric spots varying in size from pin points to 1 cm. in diameter.

The mother of the child gave a history of a similar attack a year ago in which both knee-joints were swollen and painful and said that the child had always been inclined to abdominal trouble; but did not remember any spots until this attack. A diagnosis of Henoch's purpura was made and the condition cleared up in a few days.

It is quite evident that in this case, except for the fact that a thorough examination and a complete history revealed the presence of purpuric spots and the previous occurrence of a similar attack, an operation might have been undertaken.

Osler describes a second similar case admitted a year or so later in the same way. Lichty and Donaldson record two more quite identical ones and another has occurred in my own service.

CASE III.—In 1907, a colored boy, aged about fourteen years, was sent into my service at Providence Hospital with a diagnosis of acute appendicitis. There was a history of two or three days' illness, with slight fever, vomiting and intense abdominal colic, the pain and tenderness being most severe in the region of the appendix. In the examination of the boy there was found a general purpuric eruption over both legs and a diagnosis of purpura was made. No operation was done and a rapid recovery followed. The patient remained in the Hospital as an elevator boy for a year and had no recurrence of the trouble. He gave an old history of rheumatism and there is no doubt that an examination of his legs at the time of his rheumatic attacks would have revealed the presence of purpuric spots and that the case was undoubtedly a true Henoch's purpura.

By permission of Dr. Harrison Crook I am enabled to record a case in which the appendix was removed.

CASE IV.—A boy, aged twelve years, was admitted to Providence Hospital in the service of Dr. Crook in 1905. He had

DR. JOSEPH C. BLOODGOOD, of Baltimore, discussed the metastasis in the glands of the neck in laryngeal cancer, referring to cases operated on for cancer of the larynx followed by recovery and subsequently dying from metastasis in the glands of the neck. He emphasized the fact that the inability to palpate these glands is no indication that they are not involved. He also advised that the operation of laryngectomy be done under novocain.

#### PERIOSTEAL ROUND-CELLED SARCOMA OF FEMUR.

DR. WILLIAM B. COLEY, of New York, read a paper with this title, for which see page 97.

DR. ALBERT J. OCHSNER, of Chicago, reported a case of inoperable round-celled sarcoma of the ilium which was opened, the diagnosis made and confirmed, and the patient treated by the Coley toxins with apparent recovery; two years later a new tumor appeared in the same region, increased rapidly in size; toxins again administered but without effect, the patient succumbing to the condition. Autopsy revealed the fact that the secondary tumor was not a sarcoma but a cyst at the bottom of which was a carcinomatous degeneration. This case convinced the speaker that the same micro-organism is the cause of sarcoma and of carcinoma under different conditions.

DR. WILLIAM H. WELCH, of Baltimore, called attention to the fact that, in the sections examined, apparently different opinions were reached but that in reality this was due to the fact that different portions of the tumor showed different conditions, there being in fact two tumors, a sarcoma and an epithelioma. He considered it unfortunate that the sections of the primary growth are not obtainable in order that a definite opinion might be reached as to whether the recurrence is of the same or a different type of cell.

DR. JOSEPH C. BLOODGOOD, of Baltimore, said in reference to the supposition that the secondary growth in Dr. Coley's case might have resulted from the X-ray treatment, that he had a patient now seven years after a primary and two secondary growths operated upon and treated by the X-ray. He was of the opinion, however, that the result obtained in Dr. Coley's case, of disappearance of the tumor and an interval of ten years before reappearance, justified in inoperable cases the trial of the mixed toxins of erysipelas and bacillus prodigiosus.

CASE V.—A girl, aged five years, was seen in consultation with Dr. Blair Spencer in November, 1910. There was a history of abdominal disturbances beginning shortly after birth and at the age of two years there was vomiting of blood. In August, 1909, she had an acute illness with temperature  $103^{\circ}$ , great abdominal pain and intestinal hemorrhages for several days. She had another attack similar to this in September, 1909, when she was operated upon by another surgeon. No abdominal findings were recorded except "general intestinal distention." After this operation she came under the care of Dr. Spencer and, with careful dieting and hygiene, her condition improved and for a year she was quite well. Again in November, 1910, she had an attack in which bright blood was vomited and she was brought into the hospital. She was in a state of collapse; temperature,  $96^{\circ}$ ; pulse practically uncountable. With the administration of horse serum there was complete cessation of hemorrhage and the child rapidly regained its normal health. Since this time she has had one or two similar, though milder, attacks characterized by vomiting of bright blood and bright blood in the stools. With each of these attacks there have been purpuric spots on the limbs, intense abdominal pain and pains in the joints. In each instance an injection of horse serum has served to check the hemorrhage. During the past year she has been given periodic small doses of the serum and has been free from trouble and is now well nourished and apparently in excellent health.

A review of the recent literature would lead one to take a rather more serious view of the visceral complications than that suggested by Osler and Pratt; for, in addition to those cases which at operation have revealed nothing for which operation was demanded, there are many in which operation was necessary and others in which death has occurred from intra-abdominal causes with and without operation. In looking over these cases one is struck by the fact that the chief seat of the lesions is the ileum, especially its lower portion in the neighborhood of the ileocæcal valve. All grades of lesions can be traced from simple hemorrhage or œdema to

DR. JOSEPH C. BLOODGOOD, of Baltimore, said that he had encountered a number of cysts in the neck lined with endothelium, having no apparent connection with the blood system, and had also seen them in the axilla and groin, occurring without trauma. Three of these cases, which in all number less than 20, have been malignant, evidenced by the presence of blood and papillomatous growths of the cyst wall, these papillomata making excision extremely difficult if not impossible. He advised early removal of liygromata to avoid malignancy, which seems to be a late development.

#### DIAGNOSIS AND TREATMENT OF BORDER-LINE PATHOLOGICAL LESIONS.

DR. JOSEPH C. BLOODGOOD, of Baltimore, in his paper said that by border-line pathological lesions are meant those in which it is difficult, clinically, or from the gross appearance, or from the frozen microscopic section, to come to a definite conclusion as to whether a lesion is benign or malignant. The earlier after the first symptom patients present themselves for treatment, the greater will be the number of cases in which the diagnosis will present difficulties; in this stage the prognosis after proper treatment is best. It is the opinion of the author that we have sufficient experience at the present time to allow us to formulate definite conclusions as to the proper method of diagnosis and treatment in this stage in which the result should be the best. Incomplete removal of any malignant disease in its earliest stage gives much worse results than complete removal in a later stage; this fact must be always borne in mind. Incomplete removal of a distinctly benign lesion, with the exception of the angioma, is always followed by the reformation of the tumor from the residues left behind, and the chances of malignant change in these residues are greater than in the undisturbed benign lesion; this fact also should be kept in mind.

These border-line pathological lesions, from the standpoint of diagnosis and treatment, can be divided into three great groups.

Group I. In this instance the complete excision of the palpable nodule can be accomplished without danger and without mutilation, so that after its removal it makes little difference what the microscope shows: the proper operation has been done.

Group II. Here also the complete excision of the nodule can be accomplished without danger or mutilation, but there is a

the majority of these intussusception was suspected; 9 of these recovered, 1 died in eight hours, one later of pneumonia and a third in three weeks of nephritis. In 8 cases intussusception was demonstrated at operation, 4 being treated by resection and 4 by reduction, with 3 recoveries by each method. Three were unoperated with 1 recovery, making 11 actual cases of intussusception.

In regard to treatment two points are suggested: (1) the efficacy of injections of serum, and (2) the diminution of peristalsis for the relief of abdominal colic and the possible prevention of intussusception.

In the administration of foreign serum we have a valuable aid in the treatment of hemorrhagic tendency. Human serum is to be preferred; but fresh rabbit or horse serum may be used and in the absence of these the ordinary diphtheria antitoxin will suffice. In Case V of my series, small doses (10 to 15 c.c.) of normal horse serum served to check the hemorrhage during an attack, and under periodic doses no further attacks have occurred. In several hemorrhages of the newborn it has seemed to act as a specific. Successful treatment of purpuric conditions with human serum has been reported by Luton, Wilson, and others.

It is interesting to note from the operative reports that in the majority of instances there is not absolute occlusion of the bowel; also that the intussusception is undoubtedly caused by a primary area of œdema or hemorrhage, usually in the lower ileum, acting as a definite obstruction.

In the presence of abdominal crises we can therefore assume the existence of such an area. By keeping the intestinal tract empty through starvation and gastric lavage and by further lessening peristalsis with small doses of opium, the colic may be controlled and the possibility of the commonest and most serious abdominal complication, viz., intussusception, may be greatly lessened. In case of grave suspicion as to the nature of the abdominal condition an exploratory laparotomy is not greatly to be feared; for of the 12 cases unnecessarily operated on there was only one death which

thesia, the palpable area is excised with the cautery and immediately studied under the microscope in a frozen section. If the section shows carcinoma, then the more radical operation must be proceeded with at once.

As an example of Group III, may be used a lump in the breast, one in which a clinical diagnosis is impossible. The surgeon cuts down upon the lump. In the majority of cases the differential diagnosis between benign and malignant is best indicated by the gross findings. In many instances the frozen section is more difficult to interpret than the gross pathological picture. In a few instances the frozen section is helpful, for example, between an intracanalicular myxoma and a medullary carcinoma.

The next important question to answer is, what shall a surgeon do when in doubt after he has exhausted clinical, and gross and microscopical pathological investigation. It is the author's opinion that we have sufficient evidence to answer this question. It rests upon the knowledge of the frequency of malignant disease in the different regions and the results of radical treatment. In the breast, the complete operation for cancer should always be performed for any lesion in a woman over 25 unless the benignity of the lesion is established. The complete operation should follow immediately upon the exploratory incision. This conclusion is based upon the fact that the mutilation of the complete operation is but slight, the additional danger is little if any, while the probabilities of a cure of the malignant tumor, subjected to complete operation in this doubtful stage, is 80 per cent. or more; if the operation is done in two stages the chances of a cure are reduced to almost nothing.

In bone lesions the mutilation of amputation is so great and the chances of a cure of any doubtful lesion, should it prove malignant, are so slight, that the most conservative operation should always be chosen. This is also true for doubtful lesions in the nasopharynx and antrum, on the alveolar border of the jaws, and in the body of the lower jaw.

Dr. Bloodgood is confident that if surgeons will carefully investigate these lesions clinically, scrutinize their gross appearance and look at the frozen sections, and keep a check on their results up to date, they will soon be in a position to meet the requirements of the diagnosis of these border-line pathological lesions inasmuch as immediate treatment based upon this investigation will lead to a removal of the lesion, giving the patient

ANEURISM OF THE INTERNAL ILIAC.\*  
PROBABLY IMMEDIATELY FOLLOWING A SEVERE INSTRUMENTAL DELIVERY:  
OPERATION AND PARTIAL CURE.  
BY ARCHIBALD MacLAREN, M.D.,  
OF ST. PAUL, MINN.

IT seems that such a rare condition as an aneurism of the internal iliac should be reported. Matas, in *Keen's Surgery*, in reviewing the general subject of aneurism reports several thousands from the literature and does not give a single instance of internal iliac aneurism. Ericson in a large number reports a single case.

Aneurism is a disease of middle life. R. W. Parker quoted by Eve, in *Park's Surgery*, from a study of the literature only found 15 cases of any form of aneurism under twenty years of age. McGraw in *Transactions of the American Surgical Association*, of 1909, reports 64 cases in young people, compiled from the Surgeon-General's Office.

*Case Report.*—Mrs. J. J. F., first came under observation, October 4, 1911, with a pulsating tumor in the left pelvis about the size of a tennis ball.

*Previous History.*—Always well until twelve years of age, when she had what was supposed to be an attack of rheumatism, lasting six weeks, but as it left her with a permanently atrophied left leg, the trouble was probably infantile paralysis; she had a marked sensation of pulsation in her left hip at this time, which slowly disappeared. She commenced to menstruate at fourteen years of age, flowing normally about three days, with twenty-eight days intervals. When a little over seventeen years of age she was married. She promptly conceived and had a normal puerperium. In March of 1911, she was confined. Her labor was very difficult and lasted seventy-two hours, being terminated by a difficult forceps delivery. On the third or fourth day after her delivery she commenced to have severe pain in the left

\* Read before the American Surgical Association, May 8, 1913.

## THE SURGICAL ASPECT OF PURPURA.

DR. JAMES F. MITCHELL, of Washington, read a paper with the above title, for which see page 258.

DR. FRANCIS B. HARRINGTON, of Boston, reported an instance in which he had performed a laparotomy presumably for obstruction, but on opening the abdomen an oedematous condition was found, the abdomen closed, and the diagnosis of purpura made.

DR. CHARLES A. PORTER, of Boston, Mass., likewise reported a case in which a bowel resection was done, the condition later proving to be nothing but angioneurotic oedema.

## REMOVAL OF STONES FROM THE KIDNEY AND URETER.

DR. JOHN H. GIBBON, of Philadelphia, read a paper with the above title, for which see page 232.

DR. FRANCIS S. WATSON, of Boston, said that, in his experience, bilateral calculus had occurred in 30 per cent. of cases and simultaneously in 19 per cent. He had always obtained good results by performing a simultaneous bilateral operation in these cases, and considered this procedure had the advantage of freeing the patient from all his trouble at one sitting. In cases in which anuria is present he considers one is justified in a unilateral operation (both kidneys containing stones) only when the first kidney is seen to be so little damaged that there can be no doubt that it can maintain life by its own unaided functional secretory work.

DR. ALEXANDER PRIMROSE, of Toronto, Canada, suggested the advisability of opening a dilated ureter at a point slightly above the stone, removing the stone by means of forceps, suturing the wound, and instituting drainage.

DR. GIBBON (in closing) said that with regard to Dr. Primrose's suggestion it would be impossible to adhere to such a procedure in a case with a mulberry stone without producing unnecessary trauma of the ureter. He agreed with Dr. Watson's remarks in reference to bilateral renal calculi, laying stress upon the point that the stones might also be found in both ureters rather than in the kidney substance itself.

## EXCLUSION OF THE BLADDER.

DR. CHARLES H. MAYO, of Rochester, Minn., read a paper with the above title, for which see page 133.

DR. FRANCIS S. WATSON, of Boston, reported the case of a patient in one of whose loins he established a permanent renal

TRANSACTIONS  
OF THE  
AMERICAN SURGICAL ASSOCIATION.

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*Meeting held in Washington, D. C., May 6, 7 and 8, 1913.*

The President, CHARLES A. POWERS, in the Chair.

ADDRESS OF THE PRESIDENT.

THE INFLUENCE OF THE AMERICAN SURGICAL ASSOCIATION ON THE PROGRESS OF SURGERY IN AMERICA.

The President, DR. CHAS. A. POWERS, of Denver, Col., delivered the opening address, for which see page 1.

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FIBROMATOSIS OF THE STOMACH.

PROF. DR. ALEXIS THOMSON, of Edinburgh, Scotland, read a paper with the above title, for which see page 10.

DR. JOSEPH C. BLOODGOOD, of Baltimore, said that he had examined and seen at operation four cases of this disease. The thing which had impressed him most was the fact that in other lesions there is a similar production of connective tissue out of proportion to any known etiologic factor, one of these being in osteitis fibrosa. Another, in slight infections such as acne; again in desmoid tumors. He cited an instance of a patient suffering from leontiasis plastica in which a positive Wassermann reaction was obtained, the patient being treated by salvarsan preparatory to operation. In the four cases he had observed of fibromatosis he was surprised by the absence of adhesions between the peritoneum covering the stomach and the surrounding viscera, and also by the fact that in spite of the enormous increase in connective tissue throughout the wall of the stomach the peritoneal surface remained free.

DR. JOSEPH A. BLAKE, of New York, suggested that the condition of fibromatosis might be due to a very slight infection giving rise to a rather diffuse round-celled infiltration with marked reaction on the part of the tissue to the irritation, and

that he believed before one could intelligently deal with this question it would be necessary to learn what effect was produced upon the patient by injection into his rectum of large quantities of his urine prior to operation. He had reached this conclusion after losing a case because of evident poisoning from this source.

#### SURGERY OF THE PANCREAS.

DR. WILLIAM J. MAYO, of Rochester, Minn., read a paper with the above title, for which see page 145.

#### PANCREATIC LYMPHANGITIS.

DR. JOHN B. DEAVER, of Philadelphia, read a paper with the above title, for which see page 151.

#### ACUTE DIVERTICULITIS OF THE SIGMOID IN CHILDREN.

DR. JOSEPH RANSOHOFF, of Cincinnati, read a paper with the above title, for which see page 218.

#### EXCISION OF THE INFARCT IN ACUTE HÆMATOGENOUS INFECTIONS OF THE KIDNEY.

DR. LUCIUS W. HOTCHKISS, of New York, read a paper with this title, for which see page 226.

#### RUPTURE OF THE BLADDER.

DR. GEORGE WOOLSEY, of New York, read a paper with this title, for which see page 244.

#### LEGAL RESPONSIBILITY TO THE SURGEON WHICH THE USE OF THE X-RAY INVOLVES.

DR. ELLSWORTH ELIOT, JR., of New York, presented this paper, which was read by title.

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ANNALS OF SURGERY,  
227-231 South Sixth Street,  
Philadelphia.

which is a fibromatosis of the subdermal tissues, there were a great many analogies to this diffuse progressive form of fibromatosis encountered in the stomach. He referred to a case suffering from fibromatosis which was operated on under the impression that it was cancer, the mistake being discovered at autopsy.

DR. ARPAD G. GERSTER, of New York, referred to a case of excision of a pyloric tumor diagnosed as carcinoma, where in the removal he found that he had cut through a substance very much resembling malignancy and therefore feared he had not made a wide enough excision, but on microscopical examination, although the body of the tumor was proven carcinoma, the surrounding material was a simple fibromatosis.

DR. WILLIAM B. COLEY, of New York, declared that in his opinion the clinical signs with regard to these tumors of the pylorus are of more value than the microscopical report if the latter prove negative for malignancy, and cited a case in point operated upon by Dr. Mayo in which the clinical diagnosis was carcinoma, the pathologist failed to find any trace of this condition, yet the patient died two years later with general carcinomatosis.

#### DIAGNOSIS AND TREATMENT OF FRACTURES INVOLVING THE KNEE-JOINT.

DR. JOHN B. BLAKE, of Boston, Mass., read a paper with the above title, for which see page 27.

DR. HARRY M. SHERMAN, of San Francisco, did not agree with those who hurried the removal of the splint in fractures of joints, believing immobilization kept up for time sufficient to get solid union was imperative. He did not believe immobilization was the cause of ankylosis but that trauma to the joint itself did result in this condition because of adhesions. To strengthen this argument he referred to the long splint life of children with tuberculosis hip-joints in which absolutely no ankylosis resulted. With regard to passive motion, he argued that passive motion which produced pain produced trauma and should be guarded against.

DR. CHARLES L. SCUDDER, of Boston, said that one should be guided, according as to whether the fragments had been reduced and the articular surface restored to the normal, in one's judgment regarding the time of relieving immobilization and beginning passive motion, calling attention to the fact that a longer

nected with the gastric fistula and the upper end with the oral stump of the œsophagus by a skin-plasty.

Next to the necessity of the seriatim operating, the threatened necrosis of the transplanted jejunal coil represents the weak point of this otherwise ingenious procedure.

At this stage of the evolution of the subject in question, it meant real progress when Jianu proved by a number of successful operations upon dogs that the major curvature of the stomach can be used for the formation of a tube, of which one end remains in connection with the gastric fundus, while the other free end can be brought up under the skin of the thorax to a point not far from the clavicle.<sup>1</sup> Before him others had tried to solve the task in a similar manner, Depage<sup>2</sup> making use of the lesser curvature; Hirsch<sup>3</sup> of the anterior wall of the stomach.

Not long after the publication of Jianu's article, Roepke tried the method for the first time on a patient with cancerous stricture of the œsophagus, and it proved a perfect success.<sup>4</sup>

In December, 1912, a female patient, forty-six years of age, came under my care at the German Hospital who had found increasing difficulty in swallowing for the last six months. A sound showed a stricture nine and one-half inches behind the incisor teeth, and the X-rays revealed the presence of a stricture involving several inches. œsophagoscopy was difficult on account of abundant salivation and mucous accumulation in the œsophageal pouch above the narrowed lumen. In view of the contemplated resection of the œsophagus, Jianu's method of gastrostomy, which represents the first stage of extrathoracic œsophagoplasty, appeared clearly indicated. The operation was done on December 26, 1912, the procedure of Roepke being followed pretty closely, as follows:

<sup>1</sup> Gastrostomie und œsophagoplastik. Deutsche Zeitschrift für Chirurgie, vol. 118, p. 383, 1912.

<sup>2</sup> Résultats d'une nouvelle méthode de gastrostomie, x French Surg. Congr., 1903.

<sup>3</sup> Plastischer Ersatz des œsoph. aus dem Magen. Centralbl. f. Chirurgie, 1911, N. 48.

<sup>4</sup> Centralblatt f. Chirurgie, No. 46, November 16, 1912.

the joint by the surgeon until after the fourth week. In only two of the 78 cases did he encounter trouble in getting motion; these two patients gave a previous history of rheumatism, and eventually good motion was obtained. Subsequent fracture of the opposite patella in four cases; refracture of the same patella in two cases. Dr. Delatour said that in compound fractures where he had used the Lane plate he had always had to remove the plate, and therefore he now inserted an ivory plate which never required removal.

DR. ARPAD G. GERSTER, of New York, sounded a note of warning in the too great eagerness to follow the open method in fractures, and reported in detail a fatal case occurring in spite of the most careful precautions.

DR. JAMES E. MOORE, of Minneapolis, considered that keeping the injured member quiet long enough to allow nature to bring about a natural healing in the bone, by letting the patient exercise it himself afterward, the greatest number of good results would be obtained. He considered it more important to treat most carefully joints in adults than in children with regard to the after-treatment. Great difficulty is sometimes encountered about the knee-joint after fracture of the neck of the femur in old people, and in such cases he advocated passive motion to the knee-joint.

DR. CHARLES N. DOWD, of New York, said the results in bone injuries in children are much better than in adults, and that these results in children were much the same whether treated by the most improved or by the old-fashioned methods. He therefore emphasized the point that interference in children is not as necessary as in similar injuries occurring in adults.

DR. JOHN B. MURPHY, of Chicago, said that the cause of most of the trouble in fractures of the elbow-joint was the luxation backward of both condyles; that this was more common than was supposed, and that it was absolutely essential that a differential diagnosis between fracture of both condyles and of only one condyle be made before treatment was instituted. In double fracture, dressing in full flexion, using the arm as a splint for the forearm, will bring the two condyles forward to a safe position. He emphasized also the point that when exercising a fracture it should never be carried to the point of causing pain to the patient.

DR. JOHN BAPST BLAKE, of Boston (in closing), stated that he had not infrequently encountered cases of fracture of the

border of the sternum, a horizontal incision  $1\frac{1}{2}$  in. in length was now made, down and through the fascia of the pectoralis major muscle, the fibres of the latter bluntly divided and a tunnel bored below the muscle with a large curved clamp. With the tip of the latter, when it emerged into the upper end of the abdominal wound, were caught the threads (left long) of two inverted sutures, which had been placed in order to temporarily occlude the tip of the newly formed tube, and drawn up and out of the upper chest wound, until the occluded tip of the tube projected for about half an inch. Now the abdominal wound was properly closed by sutures, the upper ones catching the stomach on their way, thus lifting it up, and the end of the new tube opened up by cutting the two inverting sutures, and fastened to the borders of the small chest wound. (Fig. 3.) Of course, this opening of the tube might be done twenty-four to thirty-six hours later, as, for instance, with the sigmoid in inguinal colostomy. However, with proper care asepsis can be nicely maintained and it is better for patient and surgeon, if the work can be finished at the time of the first operation. In this case the asepsis was disturbed later on by a fascia necrosis, due to gangrene of the seromuscular coat of the uppermost extremity of the new tube, the gangrene having been caused by fastening the tube in place with through and through sutures, which evidently constricted the vessels. This proved to be a technical mistake. In view of the fact that the nourishing vessels enter the new tube in a horizontal direction, its seromuscular coat should *not* be surrounded by the sutures which have to anchor the top end of the new tube. *The mucosa alone* should be lined to the borders of the skin wound. Nevertheless, the patient was up and about on the ninth day after operation; she was presented before the New York Surgical Society on the twelfth day, Jan. 8, 1913. (See ANNALS OF SURGERY, Transactions of the New York Surgical Society, April, 1913, No. 4, pp. 586 and 587.) So far the intended thoracotomy could not be done on account of a perichondritis of the rib cartilage and also of the border of the sternum, to which the submuscular suppuration had spread. Meanwhile the patient enjoys full diet, the food, after thorough chewing and salivation, being deposited in some kind of warm fluid and then washed down into the stomach through a funnel. Weight is slowly increasing. She permanently wears a large sized rubber

bility of performing major amputations in two stages, first blocking the nerves and dividing them, tying the arteries and subsequently the veins, and then at a second operation within two to four days finishing the amputation.

DR. WILLY MEYER, of New York, with regard to the question of anaesthesia in these cases suggested regional anaesthesia by injection of nerve ends, and also considered that intravenous anaesthesia would be worth a trial in such a large number of cases as fell to the author of the paper.

DR. W. L. ESTES, of South Bethlehem (in closing), considered that the fact that amputation at the knee-joint showed less mortality than in the upper third of the leg was sufficient to warrant its employment. He stated, in reference to Dr. Halsted's suggestion of a warm bath, that in many cases with large areas of torn tissue it would be impossible to carry this out because of the liability to sepsis. His method of amputation consists in the gradual dissection of the part without the use of Wyeth's pins; there is very little bleeding, and the after results are very good. So far as the two-stage operation was concerned he thought this should be taken into consideration, but in his opinion the dread on the part of the patient of a second operation far outweighed in effect the good results claimed for it.

#### CONGENITAL DISLOCATION OF THE HIP—A RATIONAL METHOD OF TREATMENT.

DR. HARRY M. SHERMAN, of San Francisco, Cal., read this paper.

He pointed out that in congenital dislocation of the hip, all the components of the joint, femoral head and neck, acetabulum and capsular ligament, are variants, in greater or less degree, from the norms, and that of these the capsular ligament, elongated and narrowed, is the chief obstacle to easy or complete entrance of the femoral head into the acetabulum, while the twisted femoral shaft, which gives the neck and head a forward direction instead of one inward and but a little forward, is the chief cause of reluxation and the assumption of the position called the anterior transposition. Therefore the writer advocates and practises reposition through an incision. This, placed between the tensor vaginæ femoris and the long head of the rectus femoris, cuts no nerves and naught else than connective tissue in exposing and entering the capsular ligament. Through this



entitled: Observations on the Surgery of the Aorta; and by DR. W. S. HALSTED, of Baltimore, entitled: Partial Occlusion of Aorta by Spiral Bands of Fresh Aorta Wall. For these papers, see preceding pages of ANNALS OF SURGERY.

*Discussion.*—DR. F. B. LUND, of Boston, called attention to the value in these cases of employing the Meltzer-Auer intratracheal insufflation apparatus, reporting a case in which he had used this, the operation being the removal of a sarcoma of the chest wall with three ribs, and in this case, as in others, the result had been most satisfactory. He emphasized the advantage of the employment of this apparatus where the pleura is to be widely opened and where there are no adhesions of the lung to the chest wall.

DR. HOWARD LILIENTHAL, of New York, in reference to Dr. Freeman's paper, said that in arteriovenous anastomoses the technic was of prime importance, and considered it most important to use the very finest needles that can be handled, No. 13 or No. 14, together with 6 o silk well vaselined. He considered the end-to-end suture the best as it afforded the minimum chance of thrombosis.

DR. JAMES E. THOMPSON, of Galveston, cited a case of suture of the heart, in which it was believed that the right ventricle was penetrated; autopsy, however, showed that the wound was in the interventricular septum.

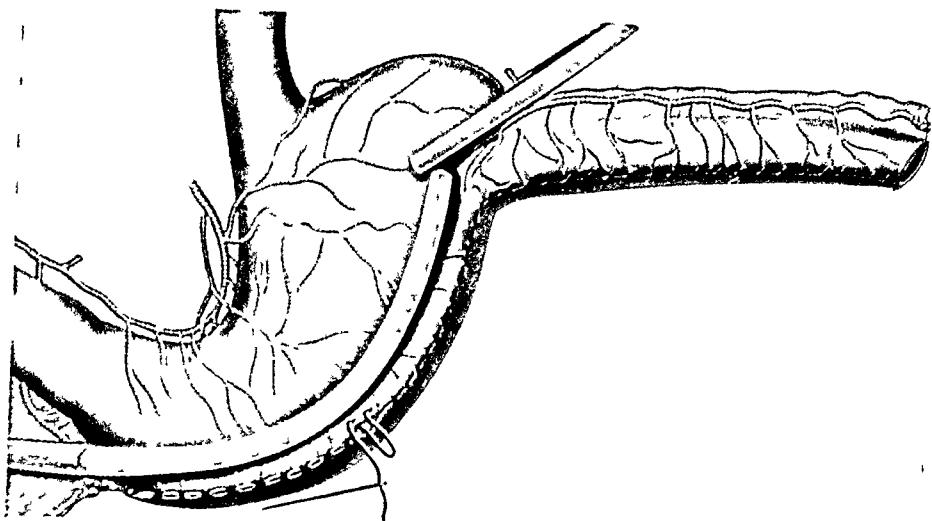
MR. ALEXIS THOMSON, of Edinburgh, reported a case in which an arteriovenous anastomosis was done first on one side, and at a subsequent time on the opposite side for threatened gangrene; the anastomoses being of the femoral artery and vein at the apices of Scarpa's triangle. This same patient still later developed a hemiplegia and at her own request her common carotid was anastomosed with her internal jugular vein.

DR. WILLY MEYER, of New York (in closing), said that although all agreed that under most circumstances the Meltzer-Auer intratracheal insufflation was indicated, yet there were cases in which the cough reflex was advantageously retained, and that in such cases this apparatus encountered the mouth to such an extent that one of the other pressure apparatuses was indicated.

#### LARYNGECTOMY FOR CANCER.

DR. GEORGE W. CRILE, of Cleveland, read a paper with this title, for which see page 164.

FIG. 2.



"Jianu tube" turned up; the second row of sutures (Lembert) is placed; note the splendid blood supply and pointing upward of the proximal portion of the major omentum which, after transposition of the tube to the outside of the chest, points to the right side of the patient. The one end of the tube remains in connection with the fundus of the stomach; the free end represents the gastrostomy opening, which eventually can be sutured to the lower end of the transposed oral stump of the cesophagus, after resection of the intrathoracic carcinoma has been accomplished. (Also taken from Jianu's article.)

FIG. 3.



Photograph of the first patient, forty-six years old, who was operated upon at the German Hospital according to Jianu-Roepke's method on December 26, 1912, as described in this article.

Furthermore, since recent developments have shown (Ach's patient living 17 days after resection of the œsophagus, Torek's first successful case of resection of the œsophagus for a carcinoma behind the aortic arch) that the subcutaneous transposition of the oral stump can be done also in the human being without endangering nutrition, it would seem an advantage to have both tubes, the œsophageal stump from above and the Jianu tube from below, meet on the same level, for if they should not be long enough to make end-to-end union possible, a skin plasty would have to be done.

In thinking over this plan of operation, the question has arisen in my mind: How shall we proceed if the first stage of œsophagoplasty has been done by Jianu's method of gastrostomy in a case of carcinoma of the œsophagus with the idea of resecting the tumor in the second stage, and the case is then found inoperable.

It seems to me it would be advisable in such an event, nay, even indicated, to go ahead, same as we do within the abdomen in the case of an inoperable carcinoma of the pylorus. Here we do a gastro-enterostomy to alleviate the patient's misery. We tell his relatives the true state of affairs, but he believes—at least for a time—that he is cured; a palliative, humane treatment.

The greatest hardship for patients with malignant œsophageal stricture is their inability to swallow. Their principal desire is to have this restored. Why not then, if on thoracotomy a case is found inoperable, divide the œsophagus proximal to the tumor and invert the distal end. Then transpose the oral stump under the skin of the neck and chest and, if long enough, unite it with the opening of the Jianu tube. If it proves too short, a connecting rubber tube (Gluck, Perthes) will re-establish swallowing of liquid and semifluid food. If this should prove unsatisfactory, a skin plasty will have to be made to bridge the defect and thus complete the extrathoracic œsophagoplasty.

Even in cases where the tumor apparently totally ob-

# SOME SURGICAL FEATURES OF INJURIES OF THE SPINE, WITH SPECIAL REFERENCE TO SPINAL FRACTURE.\*

BY CHARLES A. ELSBERG, M.D.,  
OF NEW YORK.

## THE LESSER INJURIES TO THE SPINE AND THEIR SIGNIFICANCE.

INJURIES to the spinous and transverse processes and laminae are very frequent, and not a few of the conditions that are ordinarily called "sprains of the back" are really fractures of part of a vertebra, or rupture of a vertebral ligament. The many joints and bony processes surrounded and held together by strong ligaments, and the surrounding muscles, are the explanation for the remarkable strength of the vertebral column and its resistance to injuries. But the peculiar structure of the spine offers also many opportunities for fractures, for rupture of ligaments, etc. For several years I have been having X-ray pictures taken of the spines of patients who had sustained slight injuries of the back, and have been surprised by the frequency with which a fissure or fracture or part of a spinous process or tip of a transverse process has been found. These comparatively slight injuries usually cause no symptoms besides the local pain and tenderness; there is, perhaps, some stiffness of the back, and the symptoms are soon relieved by rest and simple remedies. A week or two after such an injury, the patients seem to have fully recovered, although for many months they may have some backache when they arise in the morning. We do not know, however, how often such a slight trauma may be the starting point of a long drawn-out spinal disease, of a haematomyelia, a syringomyelia, or one of the spinal glioses or scleroses—

\* Read before the New York Academy of Medicine, February 12, 1913.

tocks but otherwise felt well. Six months later he began to have intermittent cramps in the left leg, and the leg soon became stiff. Pain became constant after several months and he would feel it down the back of his leg to the heel. The pain interfered much with walking, and was made worse by exercise. No other symptoms.

*Physical Examination.*—Left knee and ankle jerks slightly exaggerated, slight diminution in sensation over distribution of third and fourth lumbar roots on the left side; slight stiffness of entire left extremity, tenderness on pressure over sciatic nerve. X-ray shows evidence of an old lesion between the fourth and fifth lumbar vertebræ.

*Laminectomy* (February 13, 1913).—Removal of spines and laminæ of second, third, and fourth lumbar vertebræ in usual manner. The laminæ, and especially the fourth, were much thickened and the spinal canal much narrowed. The cauda was bent backward at an angle and the dura was reddened on its inner surface at the spot of greatest angulation. All of the thickened bone was removed and the left fourth lumbar root divided.

Convalescence uneventful. Patient was discharged relieved of his symptoms on March 1.

Both of the above patients had undergone a prolonged treatment for sciatica. The X-ray made the clinical picture clear, and showed us that we had to deal not with a nerve but a radicular symptom.

It is possible that among the cases that are grouped as sciaticas, there may be some in which the symptoms are due to a spinal lesion, as in my two patients; in these, operative interference with removal of the pressure upon nerve-roots is indicated, and should be followed by immediate relief.

#### FRACTURES OF THE SPINE.

Fractures of the spine occur most often either in the mid-cervical (fourth to sixth cervical) or the lower dorsal (eleventh, twelfth dorsal, first lumbar) regions. In the cervical region, the spinal canal is large and the vertebræ are freely movable upon each other, while in the dorsilumbar re-

fistula by nephrostomy 16 years ago, doing the same operation on the opposite side 9 years ago, and stated that during these many years with the exception of 4 months the patient has been kept perfectly dry, free from odor, comfortable and in excellent health. He devised an apparatus (previously fully described) for receiving the renal drainage. He urged the employment of nephrostomy as being superior in results to ureterostomy stating that the advantage of the more easy performance of the latter procedure was far outweighed by the satisfactory results of the former operation, and described in detail the technic of the nephrostomy procedure. He emphasized the point that in inserting a drainage tube into the kidney it should be carried just within the entrance of the calyx into the renal pelvis, and that care should be taken to avoid having it press too hard against the wall of the renal pelvis lest it cause ulceration; this drainage tube should be of large size, which might make it necessary to stretch or enlarge the mouth of the calyx where it joins the renal pelvis.

DR. HARRY M. SHERMAN, of San Francisco, reported the progress in a case in which he did the Petersen operation for exstrophy of the bladder in a child of three years, some 12 years ago. The patient has developed most satisfactorily. Five years ago he was operated upon for inguinal hernia, and the speaker thought it was most interesting and instructive to find that even with the absence in this case of the pubic bone the anatomy of the hernia had still been preserved. At this operation he investigated the condition of the ureters in the rectum, found them in excellent condition and with no indication of an ascending infection.

DR. ROBERT G. LE CONTE, of Philadelphia, considered that experimentation had shown that the extension of infection upward is not through the lumen of the ureter but by means of the lymphatics along the course of the ureter. The longer the anastomosis, or the more ureter covered by intestine in implantation into the intestinal wall, the greater the liability to ascending infection.

DR. JOHN J. BUCHANAN, of Pittsburgh, considered the possibility of ascending infection being due to the fact that the cut end of the ureter is in reality the cut end of a mucous canal, which contracts, causing dilatation of the ureter and pelvis of the kidney, and thus predisposing to infection. He also stated

In those patients with "incomplete" cord symptoms, an X-ray examination should be made as early as possible, in the patient's bed, and evidence of bone pressure thus obtained. A lumbar puncture should be done at once, for this will show us whether there is a large amount of blood in the dural sac. If the X-ray fails to show any marked bony deformity, and the lumbar puncture reveals little blood within the dura, then we may be fairly certain that the symptoms are to a great extent due to a contusion of the cord.

Now a contusion of the cord is soon followed by an oedema of a very destructive nature or by bleeding into the spinal substance. The oedema is very apt to cause, within a few days, a complete and irremediable transverse lesion of the cord, but its spread can be prevented by the decompressive effect of the laminectomy, to which may be added a direct incision into one of the posterior columns of the cord near the posterior median septum (Allen). A small collection of blood within the cord substance may be safely withdrawn by means of aspiration with a fine needle, and the formation of a haematomyelia cavity in the cord prevented.

You may ask, where is the pressing need for operation in these patients with "incomplete" cord symptoms? Is it not better to wait and see how the case will progress? It is true that from the standpoint of danger to life, no hurry is necessary. But our aim should be to have, if possible, a perfect functional recovery. The constant pressure of bone will cause degenerations in the cord which can never be recovered from, the same is true of intraspinal blood clots, and I have already spoken of the danger of oedema of the cord. Most satisfactory results can be obtained by early operation—complete recovery of function—and good but incomplete recoveries follow late operations. In experienced hands, the danger of a laminectomy is small. The operation can be done very quickly—under local anaesthesia if necessary. In this connection, I want to relate the history of a patient who recently came under my observation, who might have been saved if early operation had been performed.

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## ORIGINAL MEMOIRS.

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### ŒSOPHAGOPLASTY.

BY WILLY MEYER, M.D.,

OF NEW YORK.

Attending Surgeon to the German and Post-Graduate Hospitals.

IN cases of inoperable carcinoma of the thoracic portion of the œsophagus, the old methods of gastrostomy (Witzel, Kader, Ssabanejew-Frank, Senn) should be resorted to, as they are not serious operations and their functional results are good.

However, if the tumor in the œsophagus is to be extirpated, the mere establishment, for feeding purposes, of a fistula below the costal arch, is nowadays no longer a sufficient procedure. The whole operation, including the making of the gastric fistula, should be planned with a view to reconstruction of the œsophagus—"œsophagoplasty," viz., the making of a tube which will enable the patient to swallow his food and pass it down into the stomach.

Lexer and Frangenheim each succeeded at about the same time in giving a patient with impermeable cicatricial stricture of the œsophagus extrathoracically a new, useful tube by a series of plastic operations. (1910-11.)

Both employed the combined methods of Roux and Wullstein who exclude and then transpose under the skin of the chest a coil of the jejunum, of which the lower end is con-

it is questionable whether recovery might not have taken place if the operation had been delayed. Undoubtedly there are rare cases which at first present the symptoms of a transverse cord lesion but which recover to a great extent, thus proving that no transverse lesion had existed.

#### OPERATIVE INTERFERENCE IN OLD FRACTURES OF THE SPINE.

In the present state of medical opinion regarding the indications for operation in recent fracture with injury of the spinal cord, it is inevitable that many patients are allowed to go on without surgical interference who should have been operated upon. I have been asked to see patients many months or years after their injury. In some of these patients, the symptoms of cord injury were not very marked for weeks or months after the accident, but after a time signs of serious and progressive interference with the cord functions appeared. In other patients, the early signs of cord injury cleared up to a certain extent and improvement soon ceased. In many of these patients the X-ray examination<sup>1</sup> made long after the injury showed that, due to the original injury or perhaps to new bone deposits, there was a marked narrowing of the vertebral canal and therefore pressure on the cord, or a partial dislocation of the body or a lamina of one or more vertebrae, which caused a decided angulation of the cord. I have described a number of these cases in a previous paper.<sup>2</sup>

Many of these patients are incapacitated on account of well-marked paralyses of one or several extremities. As I have shown in the paper referred to, they can be greatly benefited by a free laminectomy with wide removal of spinous processes and laminæ well out to the intervertebral foramina, and exploratory opening of the dural sac. By this means, a narrowed spinal canal can be widened, pressure of bone upon nerve roots in the intervertebral foramina be removed, and a marked angulation of the cord straightened out by allowing

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<sup>1</sup> X-ray pictures of the spine should always be taken from at least two sides—an anteroposterior and a lateral view.

<sup>2</sup> Loc. cit., S. G. & O., March, 1913.

After exposing the stomach by a median incision from the xyphoid process to the umbilicus, tying off the major omentum up to the place where the left inferior gastro-epiploic artery turns on to the stomach, and after double ligation and division of the right inferior epiploic artery about two inches from the pylorus, a mattress suture of silk was run through the entire thickness of the stomach about one and one-quarter inches distant from and parallel with the greater curvature (Fig. 1, dotted line), the stomach having been lifted up by the assistants in order to have the contents run toward the lesser curvature. This part of the operation could have been simplified had a suitable clamp, better still two clamps, corresponding in shape to the major curvature, been at hand. (See Fig. 1, which is taken from Jianu's article.) In placing two equally shaped clamps alongside of each other, parallel with the major curvature, the asepsis of this part of the operation can be materially improved (see further down).

The thread of the mattress suture was clamped close to the fundus of the stomach opposite the last ligature of the greater omentum, and then an incision made through the stomach along this suture. (See Fig. 1, dark line.) The portion of the stomach thus dissected was temporarily wrapped in a piece of sterile gauze. Then a second continuous silk suture, commencing again at the major curvature, inverted that part which had been closed by the mattress suture, so that the width of the stomach was reduced to about two-thirds of its normal size. After this second thread had reached the place where the mattress suture had been clamped before, it was knotted to this and then continued as a Connell stitch up to the tip of the stomach flap, transforming the latter into a rather wide tube which connected with the fundus. (Fig. 2.) It was provided with a good blood supply and covered all around with peritoneum. A second continuous seromuscular suture was added alongside this new tube, as is done in gastro-enterostomy. The length of the new tube was 25 cm. (9½ in.).

Thereupon the stomach, thus mobilized, was turned so that the base of the tube was lying at the upper end of the median abdominal incision, right below the xyphoid process. Placed upon the surface of the thorax, the free end of the tube easily reached up to the cartilage of the third rib, without any stretching of the tube. Over this cartilage, about one inch to the left

it is questionable whether recovery might not have taken if the operation had been delayed. Undoubtedly there are cases which at first present the symptoms of a trans cord lesion but which recover to a great extent, thus proving that no transverse lesion had existed.

#### OPERATIVE INTERFERENCE IN OLD FRACTURES OF THE

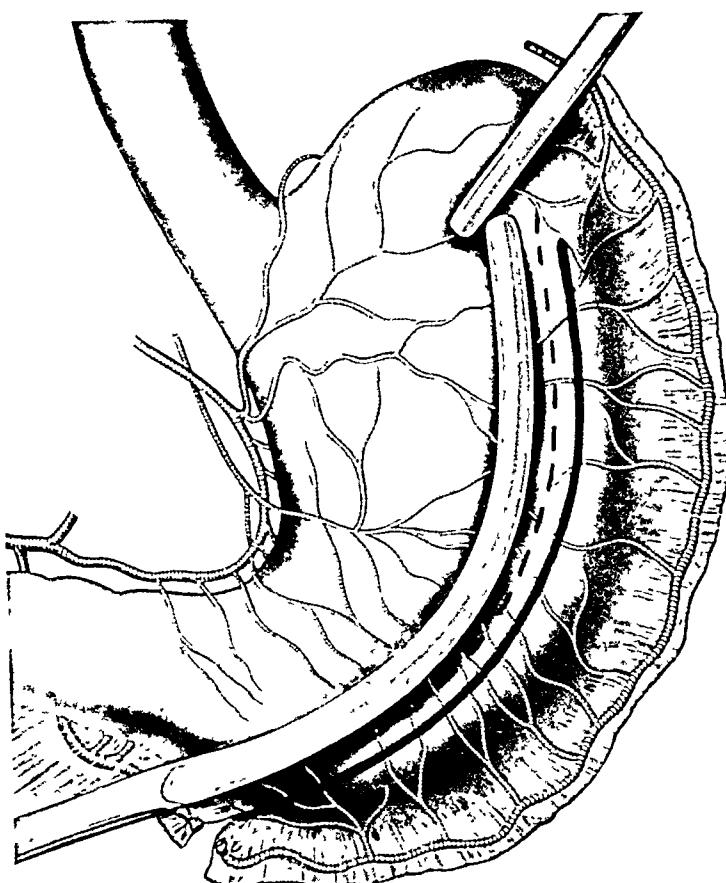
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<sup>1</sup> X-ray pictures of the spine should always be taken from at least two sides—an anteroposterior and a lateral view.

<sup>2</sup> Loc. cit., S. G. & O., March, 1913.

FIG. 1.



Major omentum has been divided (proximal ligatures are not shown in illustration). Right inferior epiploic artery doubly ligated and divided. It is wise to clear about three-fourths to one inch of the major curvature of the stomach toward the pylorus of omentum plus vessels. (This step, also, is not brought out in the illustration.) In the case reported no clamps were placed, but only the mattress suture (dotted line) which shut off the new tube from the rest of the stomach. The heavy black line represents the direction in which the scissors divided the stomach. (Taken from Jianu's article.)

CONCLUSIONS DRAWN FROM AN EXPERIMENTAL  
INVESTIGATION INTO THE PRACTICABILITY  
OF REDUCING THE CALIBRE OF THE THORACIC  
AORTA BY A METHOD OF PLICATION OR IN-  
FOLDING OF ITS WALLS, BY MEANS OF A  
LATERAL PARIETAL SUTURE APPLIED IN ONE  
OR MORE STAGES.\*

BY RUDOLPH MATAS, M.D.,

AND

CARROLL W. ALLEN, M.D.,

OF NEW ORLEANS, LOUISIANA.

(Laboratory of Experimental Surgery, Tulane University,  
New Orleans, La.).

THE purpose of the experiments, which were exclusively performed on dogs, was to find a substitute for ligatures, or metallic or other constricting bands, intended for creating stenotic or atresic circular constrictions in the thoracic aorta, all of which, in our previous experience, had proved dangerous and impracticable in the upper aortic tract, the more dangerous and fatal as they approached the heart.

The circular purse-string sutures, applied in series and imbedded in the aortic wall, which had been first tried by Haecker, in 1908, were not considered, because his experience sufficiently proves that any circumferential constriction applied to the upper aorta with sufficient force to narrow the lumen of the vessel, is almost invariably followed by ulceration and fatal hemorrhage. Haecker's sutures were applied to the first portion of the aorta immediately outside of its origin in the heart. In five experiments, three dogs died from hemorrhage during the intervention. In the fourth, the completion of the suture was abandoned on account of profuse bleeding from a stitch hole. The last animal, which survived the in-

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\* Read before the American Surgical Association, May 7, 1913.

tube within the Jianu-tube because the latter—also in consequence of the sub-muscular suppuration—developed a leak in the line of the continuous silk suture.

Ordinarily it will not be necessary for the patient to wear a rubber tube; a small piece of dry gauze will close the Jianu opening between meals. If this is not satisfactory, either a permanent tube can be worn, with the outer end plugged, or, as our observations have shown, the tube may be compressed with a piece of gauze held down by a strip of adhesive plaster placed across the chest. A truss-pad, filled with water or glycerine, held in place by straps around the thorax, will answer the same purpose. The new tube communicates freely with the fundus of the stomach. Regurgitation of food and stomach secretion can occur, producing excoriation of skin.

On basis of operations on dogs, we have recently made use to great advantage of Hueltl's wire stitching instruments in the formation of the Jianu tube in two patients, March 24 and 27. The operation on the stomach is thereby rendered absolutely dry and, of course, more aseptic; the time of the operation is also shortened. Both patients were operated upon with the help of intravenous ether anaesthesia and are doing nicely. In one the new tube is 19 cm. long (Fig. 4), in the other 21 cm. (Fig. 5.) In both the gastrostomy opening corresponds to the level of the third rib. In one of them I could have easily placed it level with the second rib, had I put the tube on the stretch.

With regard to the question of the subpectoral or subcutaneous placing of Jianu's tube, I feel inclined, even with the limited experience thus far had, to favor the subcutaneous way, for, though usually the operation will run an aseptic course, a local infection may nevertheless occur, and in that event it will be easier to cope with the subcutaneous than with a submuscular seat of inflammation. Besides, the latter may spread to periosteum of rib and sternum, or the perichondrium of the ribs, which always means a tedious convalescence.

is approached. Sutures applied to the ascending arch are much more liable to tear through and cause hemorrhage than the same sutures applied to the descending arch. In the ascending aorta the elastic media is the dominant coat and the fibrous adventitia is apparently too thin to offer any resistance to traction under the great strain and tension of the arterial stream in this region. The intima, though thick, offers little or no support to the sutures, as it is extremely soft and cuts through like wax under the pressure of the stitch. Some idea of the softness of the coat may be obtained when examining an aorta freshly removed from a dog. If placed on a solid surface and the vessel is firmly creased with the finger nail applied to the external coat, then opened and exposed, it will be found that the intima has been cut as with a knife. This peculiar friability of the ascending aorta in dogs, does not appear to be dependent upon the age of the animal, because, as Guleke has already noticed, it is sometimes observable to a very marked degree in young animals.

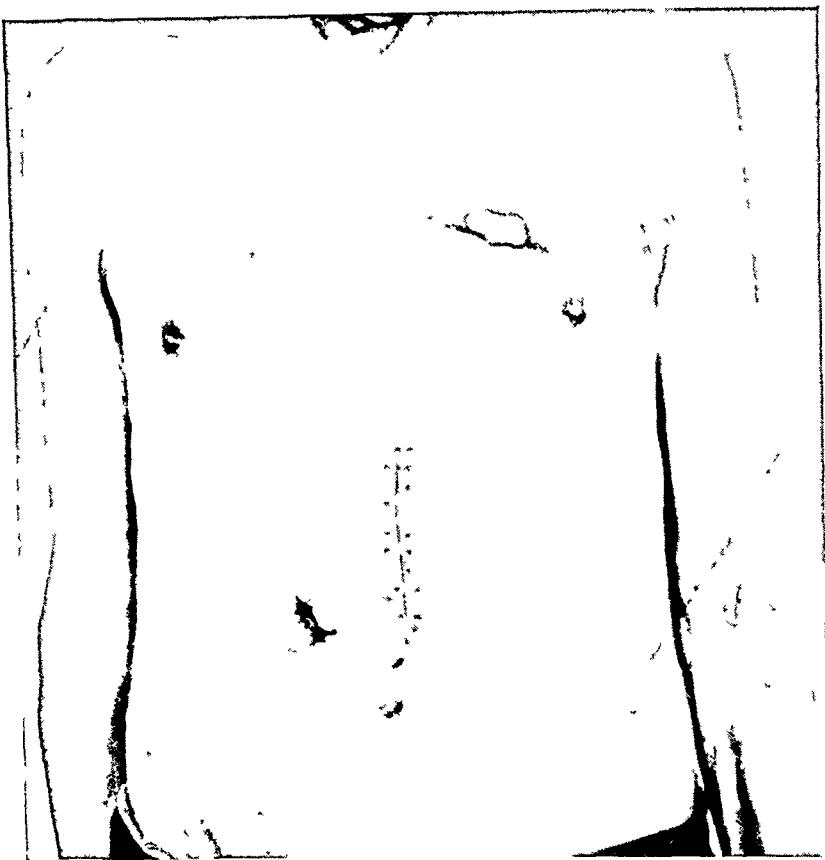
The plication of the aorta, as we have practised it, is carried out as follows: With a full curved intestinal needle (Pb No. 5, or straight milliner's needle, No. 16), in which we, in the earlier stages of this work, used No. 1 surgeons' silk (Corticelli twisted), often using it double, but later using a somewhat heavier material, the vessel wall is caught through its thickness outside the intima and at points directly opposite each other and approximated by tying. The sutures were

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vations have been made upon the human subject after the ligation of large arteries (innominate, subclavian, femoral). Acting on this hint given by Nature, I tested last winter on thirteen dogs the effect of partially occluding ligatures of fine silk, placed one above the other on the aorta, hoping that we might obtain a series of superimposed diaphragms which, if sufficient in number and extent, might sufficiently obturate the aorta to bring about the cure of the aneurism.

"But these partially occluding ligatures of fine silk, not only produced no diaphragms but gave rise, in two of the thirteen dogs, to fatal hemorrhages. From the totally occluding, crushing, coarse silk ligature in dogs, I have seen no such case of hemorrhage. Was then the fineness of the silk, or the incompleteness of the occlusion responsible for the bleeding? Or were both concerned in bringing about the result?

FIG. 4.



The second case, male, sixty-eight years old, operated upon at the German Hospital, March 24, with the help of Hultl's wire stitching instrument.

FIG. 5.



Third case female, forty-one years of age, also operated upon with the help of Hultl's instrument on March 27, 1913.

traction loop over all forms of compressing devices is that it permits the aorta to be brought near the surface, closer to the operator, without necessarily arresting the circulation; it also allows the operator to familiarize himself, before beginning to suture, with the ability of the heart to adjust itself to varying degrees of occlusion. When traction is made on the loop sufficiently to constrict the lumen of the aorta, the heart reacts by rapid, very irregular and weaker beats than normal. However, it gradually adjusts itself to the obstruction, and contracts with regularity though with less rhythmic and less vigorous contractions. When the loop is relaxed, the sudden change in the resistance which the heart has had to overcome, again causes irregularity in the heart's action which gradually subsides to normal, if the traction is not renewed.

When the suture is satisfactorily applied, dogs tolerate with impunity a reduction of one-fourth to one-third the circumference of the vessel. After an interval of three to six weeks, a second plication is attempted, beginning just below the point where the first terminated, though occasionally the second plication was made over the first. The second plications were carried to a degree which still further reduced the calibre of the vessel, so that only a small pulse could be felt in the distal part of the aorta below the suture.

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extraction of pulmonary emboli," found that the extreme brevity of the time during which these vessels, for haemostatic purposes, can be occluded with any safety to the animals (rabbits) was the chief difficulty in the operation. Lawen and Sievers performed a series of experiments to determine if it were not possible to prolong this stage of the operation by adopting different procedures. They occluded the aorta and pulmonary artery temporarily by tying a ligature around these vessels with just sufficient force to arrest the blood current and not damage the artery. They arrived at the following conclusions: The occlusion of the aorta and pulmonary artery cannot be prolonged beyond two and one-half minutes without causing the death of the animal. Death is preceded by a cessation of respiration and of heart beat. If artificial respiration is continued by intratracheal insufflation the ligature may remain *in situ* three and one-half to four minutes, beyond which recovery is impossible. If pure oxygen is insufflated into the lungs instead of atmospheric air, the occlusion of the blood-vessels may be maintained five and one-half minutes. The injection of artificial serum into the

structs the œsophagus, there is usually still sufficient drainage through a narrow and tortuous canal in the centre of the tumor down into the stomach, same as Madelung's operation (division of the sigmoid, inversion of the distal end and implantation of the proximal end in the abdominal wall) has shown the practicability of this method in cases of inoperable rectal carcinoma.

Further experience and observation is needed to find out how long the transposed oral stump of the œsophagus may be without becoming necrosed. It certainly is of the greatest importance for the patient's future, that partial gangrene with the ever-occurring subsequent phlegmon of the surrounding tissues should not set in.

In cases, in which examination previous to operation shows the cancer to be located between the aortic arch and the cardia, or right at the cardia itself, then, it has been my recent practice in animal experimentation, assuming this condition, to bring up the tube *intrathoracically*, through the foramen œsophageum of the diaphragm into the pleural cavity, and to make an end-to-end anastomosis between it and the oral stump of the œsophagus. (Intrathoracic œsophagoplasty).<sup>5</sup> A patient cured by this procedure would live on after the operation the same as he did before he became afflicted with the cancer. The only drawback of this latter, seemingly ideal procedure is, that according to present indications, the entire work has to be done in one sitting, whereas in extrathoracic œsophagoplasty Jianu's operation can be done in the first sitting and resection of the œsophagus with transposition of the oral œsophagus stump in the second. Perhaps a way can be worked out experimentally how to make the intrathoracic œsophagoplasty also a two-stage operation.

The introduction of Jianu's operation, comprising as it does, the first stage of extrathoracic œsophagoplasty—very likely also the possibility of carrying out intrathoracic œsophagoplasty—appears to have advanced by another great step the surgery of the œsophagus, which is now making headway by leaps and bounds.

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<sup>5</sup> Centralbl. f. Chirurgie, February 22, 1913, No. 8.

Auer method. The intralaryngeal tube was attached to the Matas-Smyth pump, which permits the volume of insufflated air to be regulated with nicety and also permits of cumulative positive pressure with greater certainty, when required in inflating the lungs, better than with the ordinary bellows. In our later work, however, it was found equally practicable to use an ordinary foot bellows attached to an ether vapor anæsthetizing chamber. After introducing the tube into the trachea, the thorax is opened in the fourth left interspace by an intercostal incision (Mikulicz-Spangaro) extending from near the left sternal margin to the posterior axillary line. With strong self-retaining retractors, the ribs are separated for about three inches, giving a clear view of the heart, arch, and upper part of the thoracic aorta and hila of the lungs. In this way, the left pleura is opened; the air is continuously introduced into the lungs and allowed to escape in the usual way alongside of the laryngeal catheter. After the plication has been accomplished, and before closing the thoracic incision, the lungs are expanded to a maximum, in order to expel all air from the pleura and are held to the chest wall by cumulative positive pressure long enough to complete the hermetic suture of the pleura and the intercostal space. We agree with Guleke that this is a very important detail in the technic, because if air is allowed to remain in the pleura the full expansion of the lungs is interfered with, allowing a partial pneumothorax to remain, which is followed by a profuse transudation of serum. In turn, this is secondarily infected, causing a septic pleurisy which often ends in the death of the animal in a few days. This will often happen, in spite of the most rigid asepsis and after every precaution has been taken to pack off the lungs and pleural cavity with warm sterile salt towels, leaving only the upper part of the aorta exposed in the field of operation.

Since our experience in plication, which Dr. Allen first began in May, 1910, 151 dogs have been subjected to the primary plication.

Of these, 73 were plaited a second time, and of the 78 re-

those diseases whose origin is still enshrouded in darkness and whose nature is but ill understood. Slight trauma of the spine may be a very important factor in the etiology of many spinal diseases.

#### RUPTURE OF SPINAL LIGAMENTS.

Rupture of a spinal ligament is a very frequent injury, and one to which much too little attention has been paid in the past. The most important ligaments in this connection are the ligamenta subflava or flava, which bind together the laminæ of the vertebræ and thus contribute to making a complete canal for the spinal cord. After slight injuries to the back I have seen, in two instances, very severe and perplexing symptoms arise. Both patients had sustained an injury to the back of so slight a nature that they only spoke of it when closely questioned, both suffered from what was at first supposed to be a severe sciatica which had resisted prolonged treatment. In both patients the X-ray showed that there had been an injury to the bony spine, in both the laminectomy revealed a ruptured ligamentum subflavum; both were entirely relieved by the operation.

CASE I (reported in detail in *Surgery, Gynæcology and Obstetrics*, March, 1913).—Mrs. C., forty-nine, thrown out of automobile ten months before. Severe pain over distribution of the fourth lumbar spinal root on the left side. X-ray shows thickening of arches of fourth and fifth lumbar vertebræ. Laminectomy, June 25, 1912, showed that the left lamina of the fourth lumbar vertebra had been fractured and the ligamentum subflavum torn off and rolled up so as to make pressure on the fourth lumbar posterior root. Excision of ligament and division of thickened posterior root was followed by complete and permanent relief.

CASE II.—M. C., twenty-two years of age, admitted to the service of Dr. Bailey at the New York Neurological Institute in February, 1913. Eighteen months before, patient was thrown out of grocery wagon when his horse ran away. He landed on his back and several boxes fell upon him. For three or four days he was unable to sit down on account of pain in the but-

seven days respectively, showed, as in all the dogs that had survived, a marked plication, a hypertrophy and dilatation of the left ventricle which had no doubt been initiated by the obstacle put in the way of the aorta by the first plication. The specimens of the plicated segment, in this last group, exhibited the same gross characteristics noted in the previous two cases, viz.: in all, the lumen was crowded and packed tightly by the plait of the infolded wall, narrowing it to a slit-like space, though the actual degree of obstruction varied to some extent in the different animals. In all, the infolded mass or plica, practically filled the aortic lumen, but in animals that had longest survived the operation, the potential space existing between the infolded mass and the wall was greater than in those dying within a shorter time. The causes of death in these instances were multiple. The immediate causes were: cardiac asthenia, or exhaustion, in which the previous and long standing efforts of the heart to overcome stenosis in otherwise marasmic and enfeebled animals played the chief part. In one of these dogs, the cardiac action was embarrassed by the presence of a large swarming mass of adult filaria which filled the right heart (see Fig. 5). The other two dogs had also been greatly enfeebled by uncinariasis, which is as prolific a cause of disease in the dog, as in the human species and is especially prevalent among dogs kept in captivity and in unhygienic surroundings. In all the dogs that reached the third stage of plication, the nutritional conditions were bad, leading practically to a marasmic state from prolonged confinement in the laboratory and in small enclosures which still further reduced the resistance of these animals to trauma and cardiac strain.

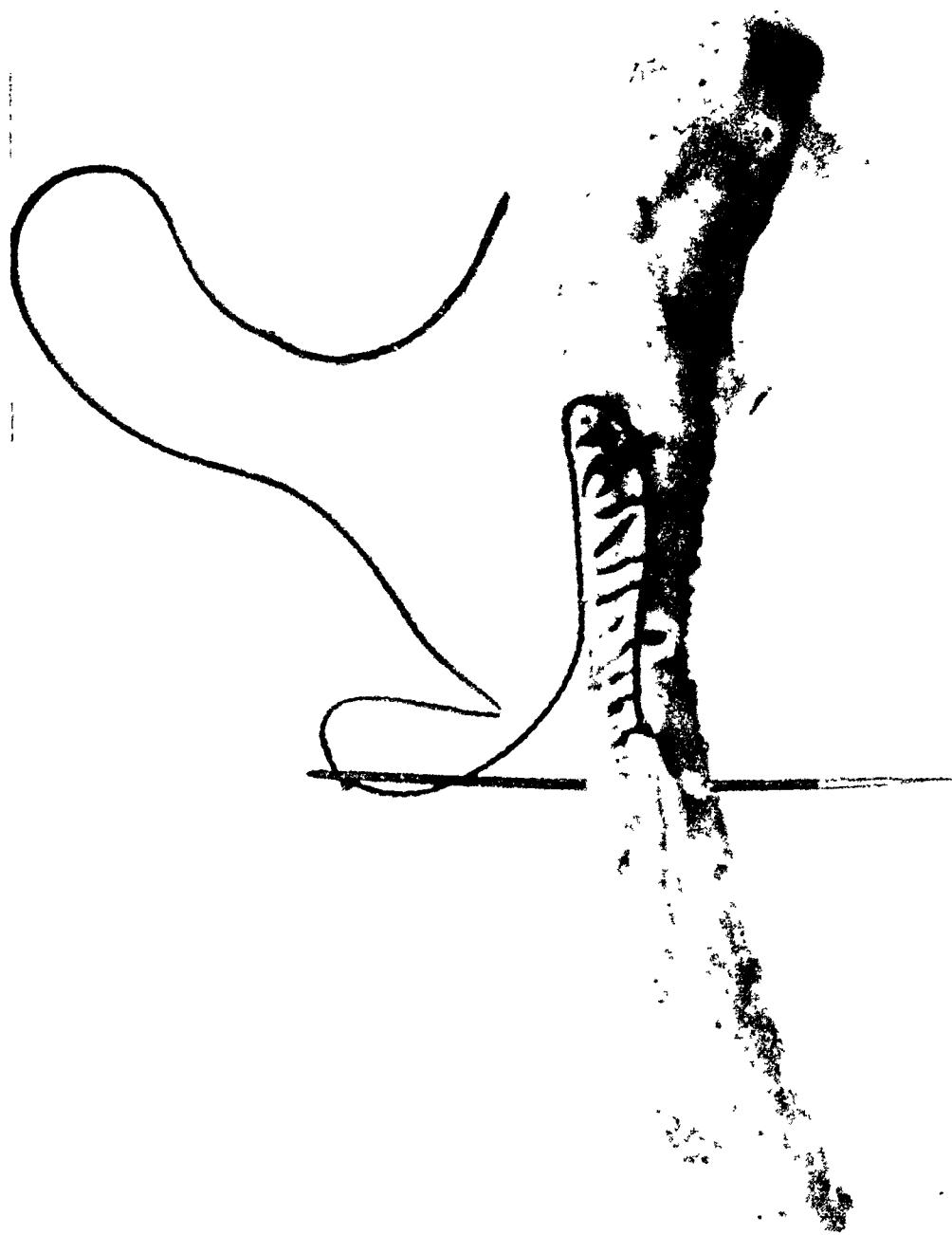
It is interesting to note that, as previously stated, in these extreme cases of stenosis, some of the animals were able to survive as long as seven days and finally died without showing any of the evidences of peripheral ischaemia, palsy of the hind-quarters and other disturbances which are characteristic of acute aortic obstruction whether from experimental or purely pathologic causes (ligatures, bands, thrombi, etc.). The absence of these special phenomena is to be accounted for by the gradual reduction of the aortic circulation, brought about by the previous plications in two sittings at long intervals, by the compensatory hypertrophy of the cardiac muscle and by the development of

gion the canal is relatively narrow and the vertebræ more fixed upon each other.

The importance of a fracture of the spine—and for the sake of brevity I shall include under this head all severe injuries to the vertebral column which are ordinarily described as fracture dislocations, no matter whether there is a fracture with or without some dislocation or a dislocation with or without some fracture—lies not in the fracture itself but in the injury that has been done to the spinal cord. Whenever the treatment of recent fracture of the spine is under discussion, we always hear most conflicting opinions—some claiming that a fresh spinal fracture should never be operated upon, others being equally emphatic in their statements that all or most spinal fractures should be subjected to operation. The supporters of this latter view base their belief upon the fact that if irremediable injury to the cord has been done, the operation will not make matters worse. Let us consider both sides of the question.

Fractures above the fourth cervical vertebra are usually followed by death, either at once or after a few hours, from injury or compression of the medulla, and are therefore never cases for operation.

In what other patients is immediate operative interference justified or imperative? Unless the patient's condition is so poor that any interference is contra-indicated, I believe that an operation is called for when we have evidence that there is compression of the cord by bone or blood or when there has occurred considerable contusion of the cord. Operation is indicated in all of these patients if the symptoms of a cord lesion are not well marked. By "not well marked" or "incomplete" symptoms of cord injury I mean symptoms from which one may conclude that there are still numerous pathways up and down the cord unaffected—there is only a partial loss of power below the level of the fracture, sensation is well preserved over considerable areas below the level of the lesion, many of the reflexes are preserved, the control of the bladder and rectum is little or not interfered with.



Section of nora magnified three times, showing method of plication. Needle is seen transfixing two folds on walls of nora with groove between. The apparent depth of the needle, as indicated in the photo, is due to the vessel being covered by cellular tissue and pleura. The coarse and woody appearance of the specimen is due to the hardening effect of the formalin solution in which it was preserved. The same observation applies to all other specimens shown in these photographs.

Mrs. H., sixty-four years of age, the mother of a physician, was seen by the writer on the evening of February 1, 1913. The previous night the patient tripped and fell down stairs, striking upon her back. She at once complained of severe pain between the shoulder-blades and said that her legs felt weak, although she was able to move them. Examination by several physicians showed that there was a fracture of the spine at about the sixth cervical vertebra, patient was able to move her arms freely, although she complained of some pain shooting down the arms; she could move her lower limbs somewhat and the knee-jerks were preserved; sensation was lost below the level of the umbilicus.

The case was not considered one for operative interference. The symptoms steadily grew worse, so that when I saw her the anæsthesia extended up to the neck; there was complete loss of motion and sensation of the lower limbs and trunk, and almost complete loss of power in the upper extremities. All reflexes were gone, as were control of the bladder and rectum. Very soon afterward the patient began to have difficulties in swallowing.

I believe that this patient might have been saved if she had been operated upon within a few hours of the accident, when there were "incomplete" cord symptoms.

If, on the other hand, immediately after the accident, the patient has a complete loss of motor power and sensation with loss of superficial and deep reflexes below the level of the lesion, and with loss of control of bladder and rectum, we know that there is probably a complete and irremediable transverse lesion of the cord, and no operation is justified. Operative interference can do no good but only harm. If the injury is in the cervical region, death will be hastened by the operation—no matter how quickly and skilfully it be done. The disrepute into which operations for recent fracture of the spine with injury to the spinal cord have fallen is due to a great extent to the fact that patients with a transverse cord lesion have been operated upon. In a very few cases, improvement has followed the operation, but in these patients there could not have been a transverse lesion in the cord, and

FIG. 4.



Shows lumen of aorta completely obliterated after three successive plications over same site. Dog died twenty hours after third operation, which at the time of the operation apparently completely occluded the aorta, the death being attributed to the combined effects of heart strain upon a pathologic heart weakened by prolonged filarial parasitism of the gross type. It was also found, at the postmortem, that the apparently complete occlusion, which had been demonstrated at the completion of the operation, had yielded during the twenty hours that the animal had survived, sufficiently to allow a small stream of water to be forced through by injecting the aorta. Apparently this exceedingly small channel was sufficient to permit a reduced circulation to be maintained and to prevent a total ischaemia of the peripheral parts. It is also probable that the remarkable adaptation shown by this animal to a greatly reduced aortic circulation caused by an almost complete atresia of the vessel was due to the development of the collateral circulation following the earlier plications.

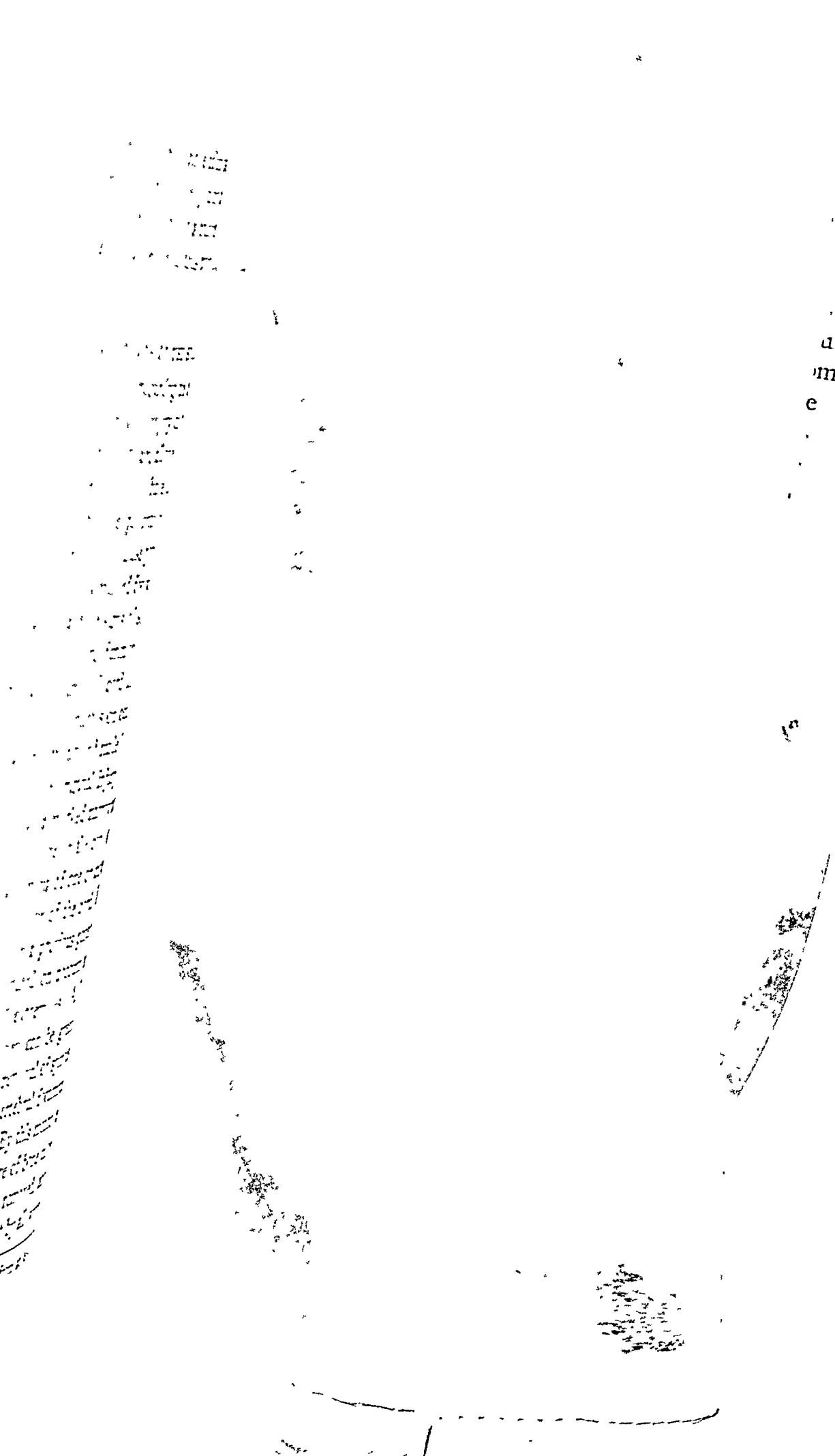


FIG. 6.



Shows internal appearance of vessel cut across at narrowest part of constriction. Animal killed ninety-seven days after second operation.

or



may be of therapeutic value, before the obstruction is either partly or entirely overcome. In the aorta, a stenosis could undoubtedly be produced by plication which would reduce the circulation in an aneurismal sac, situated in the proximal and distal side, sufficiently to bring about a cure by the deposition of fibrinous clot. In planning these experiments, in the thoracic aorta, we had contemplated a more radical procedure as the final stage of the stenotic treatment, to be applied to animals that had survived the third plication. It was our intention, after satisfying ourselves of the tolerance of the dogs to this maximum degree of stenosis, to completely divide the aorta in the infolded segment and then seal the stumps by suture or ligature. Thus we had hoped to repeat in the thorax what one of us (Dr. Allen) had accomplished successfully and repeatedly (four times) in the abdominal aorta, viz., the complete section of this vessel below the renals after a series of gradually progressive constrictions with our modification of Dr. Halsted's aluminum bands.

That the aorta can be divided in its thoracic portion below the subclavians, after a sufficient preliminary treatment by the production of gradually increasing stenoses, we believe is quite possible and practicable in young and vigorous animals kept in perfect hygienic conditions. Whether this can be accomplished more certainly and satisfactorily by encircling the aorta with organizable aponeurotic strips (*fascia lata*) as advocated by Nassetti, or with strips of dogs' aorta, as recently practised by Halsted, is a matter that must be decided by further experimentation.

Sufficient evidence has accumulated to show that in the abdominal aorta the problem of gradual occlusion, especially below the renals, has been solved. We have shown that this occlusion can be made so complete as to permit a total transverse division of the vessel and yet the animal recover permanently from the intervention, and this we have done with constricting aluminum bands. Dr. Halsted had previously demonstrated the possibility of creating marked stenosis in the lower thoracic abdominal aorta by practically the same means though he had not carried the experiment to the point

made continuous in our earlier work, but recently interrupted sutures, of the mattress type, have been preferred. The line of suture is made parallel to the long line of the vessel for a variable distance of from one to three inches. The infolding of the vessel wall progresses with each suture. The sheath of the vessel and the overlying pleura are not disturbed but included, whenever it is available, in the grip of the suture. During the suturing process no clamps are placed upon the aorta, only a tractor of stout silk or tape is passed under the vessel, in order to better draw it into the field. While the pulsations offer some disadvantage, it is much easier to work on the distended vessel, as one is better able to judge of the degree of penetration of the needle as well as determine the amount of constriction produced by each succeeding stitch than when working on a collapsed vessel. Furthermore, there is less interference with the heart's action, thus permitting a more deliberate and more prolonged work, the total occlusion of the aorta, on the proximal side of the carotid origins, being fatal in from one to four minutes.<sup>2</sup>

In our experiments no attempt was made to occlude the aorta, but a tractor of stout silk was passed around the vessel, at the origin of the left subclavian, in order to steady the vessel and bring it nearer the surface. The advantage of the

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<sup>2</sup> Our experience also confirms the observations made by Carrel and Guleke, as well as those of Lawen and Sievers, in regard to the short time that occlusion can be applied to the ascending arch without fatal consequences. Carrel found that in experimenting on dogs a total constriction of thirty-two seconds' duration can be tolerated without permanent damage to the brain. According to this investigator, the descending aorta can be compressed for seventeen minutes without fatal heart strain.

Our experiments show that a permanent contraction or narrowing of the aortic lumen in the thoracic aorta outside of the left subclavian, sufficient to obliterate the femoral pulses or to make them practically imperceptible, is tolerated by the heart of vigorous normal dogs sufficiently to permit of recovery by the rapid development of the collateral circulation.

Lawen and Sievers, in their experimental research upon "the influence of artificial respiration, strophanthin and adrenalin, upon the heart's action after a temporary occlusion of the aorta and of the pulmonary artery, in the performance of Trendelenburg's operation for the

changes, or by the atrophy of the wall, which brings the constricting band in contact with the intima or with the blood stream which in turn is the cause of an obliterative endarteritis. In the abdominal aorta, the dangers of excessive constriction with secondary ulceration or atrophic changes are guarded by the strong encapsulating rings which surround the constricted areas, a protection which is lacking in the thoracic aorta, especially in its upper segment.

In further confirmation of the preceding facts, our observations upon the sutured aorta, in the second and third operations, have shown a gradual tendency toward the reestablishment of the lumen. This has been principally due to a gradual relaxation and yielding of the sutured portion, though it seemed, in some cases, to be partially due to a compensatory dilatation of the remaining portions of the vessel wall at this point. This tendency was greater the longer the interval between the operations, and was decidedly greater after the second than after the first operation. About 65 per cent. of the cases maintained the primary degree of constriction unchanged for a period averaging about three weeks. Probably less than half this percentage (28 to 30) retained the original constriction after the second operation for the same period of time.

It is quite evident from all our observations that, if it is at all healthy, the heart and all the forces of the organism are set to work to remove the obstacle in the main channel of the circulation, thus defeating, in the course of time, the most carefully executed plans of the operator. Thus far, no animal has survived a third plication, which caused a total obliteration of the lumen, or which would permit of a complete dry section of the aorta through the plicated segment. But the capacity of the heart to adjust itself to an extreme degree of aortic stenosis, when this is gradually accomplished, is indeed remarkable and most noteworthy, as shown in the animals from which the specimens were removed which have furnished our illustrations.

The applications which we have thought might be made of the foregoing experimental facts in human surgery, are:

The first operation is remarkably well sustained by the animals. The majority survive and recover rapidly, and the fact that in our experiments 75 of the animals survived sufficiently to undergo a second plication shows not only that the heart adjusts itself thoroughly to the demands made upon it by the obstruction, but that the collateral circulation is ample provided the heart is healthy and the animal young and vigorous, and a sufficient time is allowed to elapse for the animal to recover from the effects of the primary interference.

In the early part of our experimental work the error of over-plicating and encroaching too much upon the aortic calibre, was committed and in consequence a fatal paraplegia and other evidences of ischæmia of the spinal cord and lower extremities were recorded. When death has occurred in our later cases, it has been due either to intrathoracic infection, or marasmus induced by intestinal and cardiac parasitism with the dog filaria, which is a very common form of parasitism in the dogs of our section, or by accidental hemorrhage and pleural infection at the time of the operation.

All the experiments were conducted with artificial respiration by intralaryngeal insufflation with a soft rubber catheter introduced into the trachea through the glottis by the Meltzer-

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carotids, charged with oxygen to prevent asphyxia of the nerve centres, is less positive in its results.

In this series of experiments, the circulatory arrest could continue over five and one-half minutes, on an average, without absolutely fatal consequences. By applying massage to the heart as an excitant to the cardiac muscle, combined with oxygen insufflation, a compression of the vessels could be prolonged to six and one-half minutes. By injecting adrenalin (25 mg.) into the heart immediately after the untying of the occluding ligatures, while artificial respiration with oxygen was being kept up, they were able to save animals which had been occluded seven to eight minutes.

While the heart can stand a complete ischæmia for ten minutes, by total occlusion of the superior and inferior vena cavæ (Rehn *v.* Haecker, and Sauerbruch), the brain, especially the medulla which is far more sensitive, will not tolerate a total ischæmia, even with artificial respiration by intratracheal insufflation, beyond two and one-half minutes in rabbits, and scarcely, with any degree of safety, beyond one and one-half minutes in dogs and more highly organized animals.

vided the great visceral arteries (*cœliac axis*, the mesenteric arteries, the renals) which spring from these sacs, may be safely transplanted to another level of the main trunk above or below the obliterated sac.

In the light of our present knowledge, the direct intervention of surgery in the treatment of aortic aneurism must be restricted to *explorations*, both abdominal and thoracic, which will permit us to ascertain the relations of the aneurismal sac to the parent vessel. In a certain number of cases of saccular aneurism, it may be possible to obliterate the communications leading from the sac to the artery, by the method of intra-saccular suture. In the majority of cases the operation will have to be limited to methods which will simply tend to reduce the circulation in the sac and thus favor the coagulation of its contents. This may be accomplished by any of the classical methods of wiring or by narrowing the lumen of the vessel immediately above or below the aneurism, by the use of constricting agents, whether metallic (Halsted or Matas-Allen aluminum bands), or tissue strips (aponeurosis, Nassétti; aortic, Halsted), or by suture methods, such as the plicating procedure which has been the special object of the investigations which Dr. Allen and I have conducted in the laboratory of experimental surgery of the Tulane University and which are possibly more feasible in the human aorta than in that of the dog.

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maining, 4 died of hemorrhage, 7 of infection, and 3 from the anaesthetic. Some of the remainder were sacrificed for study, while others died of parasitism or disease, or escaped through accident or neglect on the part of the laboratory employes.<sup>3</sup>

Of the 73 secondary plications, 29 died of hemorrhage; 15 of parasitism and marasmus from various causes; 7 from post-operative pleural infections; 4 escaped; 4 died of the anaesthetic, while attempting a third stage, or total occlusion, operation; in 3 no cause of death was determined.

Of the 11 which reached the third or obliterative stage of plication, 6 died of hemorrhage; 2 from pleural infections on the fourth and seventh days; 3 from parasitism and probably cardiac asthenia.

In all the more recent cases, the line of suture could be recognized though buried in a relatively thin layer of exudates; in others, the suture line was still better recognized when a shorter lapse of time had occurred between the operation and the death of the animal. In the older cases, three weeks or longer, the suture line was not clearly discernible, being deeply buried in the organized exudates and in the vessel wall which was always thickened at the line of suture. Some of the sutures relaxed, but all remained under the cover of a thin exudate layer.

The examination of the two specimens obtained from the animals dying of pleural infections, showed the line of suture fresh and thoroughly recognizable through a layer of exudate. A cross section of the sutured segment showed a very great encroachment upon the lumen of the vessel by the plicated fold which practically packed the lumen but not sufficiently to prevent the circulation of fluids under pressure. The narrow space intervening between the convexity or bulge of the fold and the ensheathing arterial wall always becoming apparent and wider whenever fluid was forced through it.

The three animals dying after a lapse of three, four, and

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<sup>3</sup> On one occasion a whole pack of experimented dogs were liberated at the close of the winter's work, for economic reasons. On another occasion a number of dogs that had survived the first and second plications were set free through the efforts of persons residing in the neighborhood of the college, to whom the yelping and barking of the dogs had been annoying, the animals being kept in an open enclosure in the college grounds.

## SOME ANATOMIC AND PHYSIOLOGIC PRINCIPLES CONCERNING PYLORIC ULCER.

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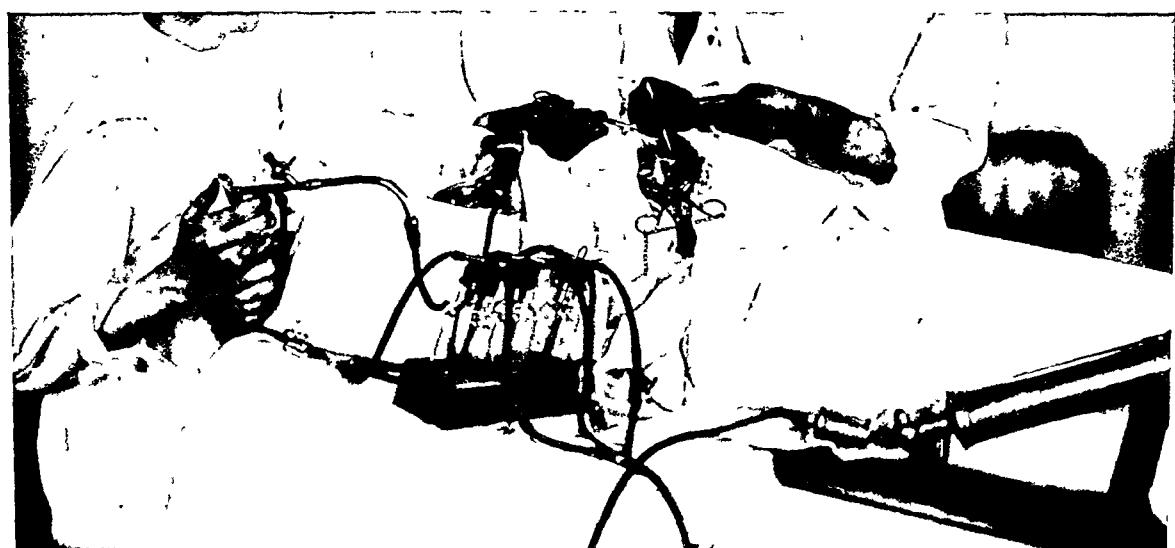
THE inclination of the present day anatomist is to present his subject to us based on its embryology and biology rather than upon the mere gross appearance. This has caused changes in nomenclature, shifting of boundary lines and in some instances changes of description when contrasted with those of older teachers.

When carefully studied in relation to development, blood and nerve supply, lymphatic drainage and especially in connection with physiology and pathology, there is ample justification for reconsideration of nomenclature in many areas. This is especially true of the alimentary canal.

Using the old nomenclature, the stomach and that portion of the duodenum as far as the point of entrance of the common duct (derived from the foregut) is functionally sharply delimited from the small intestine and proximal half of the large bowel (midgut derivatives), and this in turn has functions different from the part of the bowel beyond the splenic flexure. The abdominal part of the alimentary canal having its origin from the foregut, namely the stomach and proximal duodenum, is supplied with blood solely through derivatives of the coeliac axis; beyond this to the splenic flexure (midgut) solely through the superior mesenteric and beyond the splenic flexure (hind-gut) to the lower third, of the rectum, through the inferior mesenteric vessels. Physiologically the foregut derivatives prepare food for digestion, the midgut derivatives further digest and absorb substances, the hind-gut derivatives expel the residue. Pathologically, evidences of delimitation of these three areas are also seen.

There are several important considerations with reference to the anatomy and physiology of the stomach and duodenum

FIG. 1.



Showing general arrangement of operating table with dog on frame, Matas-Smyth pump in operation. Self-retaining retractor in position, between third and fourth left ribs, exposing thoracic cavity. Tractor of stout silk passed around aorta at origin of left subclavian, drawing heart and vessel up into wound; parts of lung seen in background above and below heart. Needle is being passed through adventitia of aorta.

does not supply any part of the tube above the common duct.

The entire pylorus and duodenum when considered together are arranged grossly in the shape of an 'S' placed transversely. This shape is comparable with that of the S-trap employed by plumbers and allows the acid chyme, bile, and pancreatic fluid to accumulate in the pyloric chamber between the sphincter muscle and the common duct. That accumulation actually occurs is shown by the fact that this part of the pylorus is always stained with bile after death and in comparison with the remaining part of the small intestine is much dilated. X-ray pictures taken after the administration of bismuth show an accumulation of bismuth in this area designated by radiographers the "pyloric cap." The S-shaped arrangement also prevents regurgitation of gas and fluid from the small intestines into the stomach. The ease with which patients under certain circumstances vomit large quantities of bile and alkaline fluid shows inadequacy of the pyloric sphincter as a partition.

The upper margin of the entire stomach along the lesser curvature and for two inches beyond the pyloric sphincter, is suspended from the liver by the gastrohepatic omentum, the free edge of which is called the duodeno-hepatic ligament. Free mobility of the stomach and proximal duodenum is thus permitted. Beyond the duodeno-hepatic ligament and especially beyond the opening of the common duct, the duodenum is securely fixed in position, behind the peritoneum.

Chronic ulcers of the pyloric region are found just twice as commonly in that portion just distal to the pyloric sphincter as they are in the part of the stomach on the proximal side of the sphincter. In 621 cases Mayo found 64½ per cent. on the duodenal side and 32½ per cent. on the gastric side of the pyloric sphincter, 3 per cent. were found on both sides. By all odds the greatest number (90 per cent.) of ulcers at present designated duodenal in location, are found in the first two inches of the duodenal portion of the pylorus and for this there are definite anatomic reasons. This location corresponds to the highest point of the pyloric region, the fundus.

Fig. 1.



Internal appearance of plicated aorta thirty-three days after operation. Defect in intima to side of plication is due to tear which occurred during mounting, after vessel had been hardened for some days in formalin solution.

soil for infection. As to whether the slightly higher location of the pylorus fundus in men (Mayo) or the slightly greater tendency to V-shape of the duodenum in women (Piersol) can account for the greater frequency of ulcer in men remains yet to be determined.

There are anatomic conditions which make possible the belief which I am about to express for perhaps the first time, that ulcer of the gastric side of the pylorus sphincter is perhaps a later development representing an extension of infection and that perhaps the lesion begins as an inflammatory process on the duodenal side of this sphincter, in the part of least defence, the fundus of the pylorus.

Anatomic conditions in women may or may not be less favorable to the development of ulcer on the duodenal side, but infection may occur and being resisted and its symptoms borne, may progress through the lymphatic vessels in the mucous and submucous coats of the pylorus to the gastric side of the sphincter where it is found at a later period on the table or at autopsy. This may account for the older figures from autopsy findings showing greater frequency of gastric than duodenal ulcer in women than in men, though doubtless as Mayo suggests, many cases in reality of duodenal ulcer, were called gastric on account of failure accurately to locate the ulcer in relation to the pyloric sphincter. This continuity of lymphatic vessels in the mucous and submucous coats of the duodenum and stomach may also account for those ulcers which are continuous across the sphincter on both sides.

Any study based on sex incidence of diseases of the digestive apparatus save those incident or secondary to pregnancy or lesions of the generative organs, gives little or no information as to the specific primary exciting cause. Men, as compared to women, are notoriously intolerant to pain and to infection. Women have both an inherited and an acquired resistance to infection. Phylogenetically we should expect processes of infection and pain to pursue a more mild clinical course, and be more easily resisted by females than by males.

FIG. 5.



Heart from same dog (Fig. 4), shows filaria protruding from openings.

## THE RELATIONSHIP BETWEEN GASTRIC AND PANCREATIC CARCINOMA.\*

BY EDWARD A. SCHUMANN, M.D.,  
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OBSERVATION of a case of carcinoma of the stomach, which had invaded the pancreas, eventually causing leakage of pancreatic secretion with subsequent generalized fat necrosis, has led the writer into a survey of the literature of this subject with the result that there is found a comparatively large group of recorded cases, wherein the combined symptomatology of a gastric carcinoma with extension to the pancreas has occasioned a peculiar, baffling train of events, presenting great diagnostic difficulties and uncertain of explanation even when the diagnosis is assured by laparotomy or autopsy.

The history of the case prompting this report is as follows:

Mrs. X, forty-nine years, III-para, a woman of excellent heredity and a negative previous medical history was first seen in consultation June, 1911, when she complained of some acid indigestion with oedema of the feet.

She was a very large, robust woman, who suffered from some distress and eructation after eating, but with no nausea or vomiting.

Examination of the chest and abdomen proved entirely negative, there was no demonstrable disease of the nervous system, the urine was normal, the hemoglobin 95 per cent. A short course of antacid treatment with regulation of the diet promptly relieved the symptoms.

In Nov., 1911, the patient suffered from an acute attack of pain in the abdomen, well localized in the right hypochondrium, the pain coming on without apparent cause and during what seemed to be normal health. She was under the care of Dr. J. O. Tilton, of Lexington, Mass., and in spite of all medical treatment failed to improve. The pain continued, the patient became

\* Read before the Philadelphia Academy of Surgery, March 3, 1913.

FIG. 7.



Transverse section of vessel twenty-five days after second operation. Vessel was constricted almost to point of obliteration of pulse. Shows marked infolding of lumen. Compare with Fig. 4, which shows complete obliteration.

impossible to examine the pancreas in detail, but it was found hard and indurated and considerably enlarged. The stomach was normal in size and presented a small thickened area at the pylorus which was buried in adhesions.

Free drainage was instituted with no attempt at any radical measures which were obviously impossible in the face of the fat necrosis and severe hemorrhage, and the patient returned to bed.

She improved slowly for ten days, with free drainage of seropurulent fluid containing pancreatic ferments, and with marked relief of pain and tenderness. Then, suddenly the temperature rose to 104° F., the abdomen became enormously distended and the patient died in collapse.

The autopsy performed by Dr. A. F. Boretti showed the parietal peritoneum thickly covered with granular and stringy fibrous exudate matting together every loop of intestine and forming a mass of adhesions around stomach and in right hypochondrium. Abdominal cavity contains (estimated) 1500 c.c. of turbid blood-stained fluid with a marked odor of formalin. Pelvic organs not remarkable. In right hypochondrium, in region corresponding to abdominal wound, several structures are firmly matted together and cannot be separated without tearing. The liver is enlarged, all its surfaces adherent to the surrounding peritoneal layers. The gall-bladder is covered with fibrous adhesions but contains no stones and is practically empty. The stomach feels thickened in its pyloric portion. The spleen is greatly enlarged, soft and held down in its fossa by soft, fibrinous adhesions. Because of the very marked adhesions all attempts at dissecting and following out the branches of the portal vein and bile ducts are unsuccessful. The intestines are removed as far as the duodenum and are not remarkable except as described. Duodenum opened *in situ*, shows no gross change. Stomach shows, bordering on the pyloric rim, and located in its posterior surface, a round, conical ulceration measuring 2 cm. in diameter by about 1 cm. in depth with an eroded, granular, grayish-red floor, the substance around it being thickened, on section presenting a grayish, nodular appearance and firm consistency.

This thickened portion tapers off gradually into the surrounding stomach wall, the mucosa of which has a granular, atrophic appearance.

*Pancreas.*—Is firmly adherent to the posterior abdominal wall and to the surrounding structures; the head and tail are normal as is the lower part of the body. In the upper part of the body, near its middle, is a mass the size of a hen's egg showing on section, the same grayish, nodular appearance noticed in the above described area in the stomach. On manipulating the structures some purulent material can be expressed from around the nodules. The nodules deeply infiltrate the normal pancreatic substance. The duct is patent as far as can be followed toward the head.

an adequate collateral circulation which seemed to be sufficient, when the third stage of plication was reached, to meet the requirements of the tissues beyond the stenosis. Lastly, by the fact that in every case the potential space existing between the infolded mass or plica and the enveloping sheath was never totally obliterated, but remained sufficiently patent to allow the persistence of a minor circulation which increased in volume in direct ratio to the duration of the survival of the animal; the longer the survival, the larger the space. In other words, there was only a stenosis and never an atresia.

The conditions which are created in the aorta by plication might be compared to those of the pylorus whenever an attempt is made to occlude it in connection with gastro-enterostomy, when this is performed for the cure of duodenal ulcer. It has been found that whenever the pylorus is obstructed by plication or plaiting by the methods of Doyen, Delling, Mayo, and others, the plicated segment always stretches and yields in the course of time, no matter how thoroughly it may be infolded upon itself by sutures.<sup>4</sup>

It is quite evident that all stenoses or obstruction caused by the infolding of mucous-lined or endothelial-lined channels, should ultimately yield and stretch sufficiently to allow of free circulation through the plicated segment, if there is sufficient power or *vis a tergo* in front of the constriction to force and direct fluids in the potential space that always exists between the opposed mucous or endothelial surfaces, as the case may be. As long as there is no actual destruction of the endothelial lining in the plicated aorta, or of the epithelium in the pylorus, at the point of constriction, by inflammatory action or other destructive agency, this space must persist, no matter how close the apposition of the surfaces may be, and is always ready to stretch and dilate by the yielding of the opposed elastic walls whenever any fluid is forcibly injected into it.

On the other hand, a stenotic condition is obtained both in the aorta and in the pylorus by the method of plication which

<sup>4</sup> See Gino Baggio: Sull' Exclusione del piloro coi metodi costrittivi, p. 1055, and F. Nassetti: Esclusioni del piloro, p. 1075 in Clin. Chirurgica, Milano, May 31, 1913, anno 21, No. 5.

The primary focus of disease was in all probability the gastric ulcer, which later suffered carcinomatous degeneration, the carcinoma subsequently becoming secondary in the pancreas. This latter organ under the irritating influence of the carcinoma became the seat of a chronic interstitial inflammation.

In a very careful study of the patient, none of these four lesions was suspected, except the pancreatitis which was considered because of the persistent pain in the left lumbar region.

That such profound tissue change could proceed without any manifestation, for a period evidently extending over several months and culminating finally in an attack characterized only by moderate abdominal pain, jaundice and slight fever, is worthy of attention.

There are on record several cases highly suggestive of the same condition, and a comparative study of these case histories leads one to the conclusion that there must exist some interaction of the nervous and chemical relations between the stomach and pancreas by which the effects of disease in one organ are, in a measure, counteracted by a compensatory or sympathetic hyperactivity of its neighbor.

A few typical case reports from the literature follow:

Bode<sup>1</sup> cites one case in a woman of 33 years, who complained for a few weeks of a feeling of abdominal fulness, some loss of flesh and strength. She developed jaundice, enlargement of the liver and retention of urine. On examination the gall-bladder was enlarged and tender, there was slight fever, the urine contained bile but was free from albumin and sugar.

Under a diagnosis of gall-stones, operation was performed; the gall-bladder was found distended with bile, its ducts obstructed from the outside, no stones or adhesions present.

The head of the pancreas was greatly enlarged by a firm, smooth tumor which obstructed the common bile duct at the ampulla. Cholecystoduodenostomy was done and the patient discharged upon convalescence.

One year later she again presented herself, much emaciated and with a tumor visible at the site of operation. On section there was found a large, nodular adherent carcinoma of the pancreas firmly adherent to the papilla.

In this case it is doubtful whether a primary carcinoma was present or whether the primary focus was in the ampulla of Vater with secondary

of complete division of the vessel at the stenotic level. He has also shown that the same constriction can be obtained by applying constricting strips of dog aorta. Nassetti has likewise shown that aponeurotic bands can be used successfully to accomplish the same purpose, but thus far a total and absolute atresia of the thoracic aorta, in its upper portion close to the arch, by any of the methods proposed, with permanent recovery of the experimented animals, has not yet been satisfactorily demonstrated.

Our experiments with plication show how nearly we have attained this difficult, but not impossible accomplishment. In the course of these experiments, a large number of segments of the plicated aorta have been preserved with the view of studying the histologic changes that take place in the plicated area and the sutured aortic walls. We had hoped to demonstrate in the course of time, that the endothelial surfaces brought in apposition by the plication would ultimately fuse and blend, through cell proliferation. In this way the potential space, to which we have so frequently referred, as existing between the endothelial surface of the plica and of the sheath, would be totally obliterated, just as the lumen of an artery is obliterated by plastic and proliferative endarteritis when it is constricted with just sufficient force to arrest the circulation in the vessel without crushing its coats. If we may correctly interpret the specimens that we have thus far obtained, it would appear that the constriction obtained by parietal suturing sufficient to infold the vessel walls, is not capable of inducing sufficient trauma to bring about an adhesive or obliterative endarteritis in the infolded segment. Dr. Halsted has also shown, by his notable experiments, in constricting the abdominal aorta with his aluminum bands, that the aortic walls may, in some cases, be infolded to a sufficient extent to narrow the lumen of the vessel short of a total occlusion for almost an indefinite length of time without the production of an obliterative endarteritis. This, however, is an exceptional result when metallic bands or circular constricting agents are used. Usually the traumatism caused by the constriction leads either to an obliteration of the vessel by ulcerative

It is perfectly reasonable to suppose that in certain cases of gastro-pancreatic disease the secretory activity of the pancreas may be excessively stimulated by the presence of an irritating neoplasm and may reflexly cause excessive secretion and hence increased peristaltic action on the part of a stomach invaded by carcinoma. The greater secretion of gastric juice, with the increased peristalsis may readily counteract the symptomatic effect of a well advanced carcinoma of that organ. It is some such interaction of function that, in the opinion of the writer, makes possible the clinical expression of the cases under discussion.

Secondary invasion of the pancreas in abdominal carcinoma is not a common occurrence. Willigk<sup>5</sup> in 467 autopsies upon patients dying of carcinoma, found the pancreas involved in 29.

Biach<sup>6</sup> found in the Wiener allgemeinen Krankenhaus in 1270 autopsies in cancer cases that the pancreas was involved in 22. In the Rudolphspital one case of pancreatic cancer was noted in 221 cases dying from this form of malignant tumor.

As to the location of the growth in the gland itself, the head is most frequently involved. Mailand<sup>7</sup> found in 57 cases, the head as the seat of disease in 35, the tail 1, the body 2 and 19 were diffuse throughout the entire organ.

Morallie<sup>8</sup> found in 113 cases of pancreatic cancer, the head affected in 82, the tail seldom involved.

Of the histologic varieties of carcinoma, the glandular type is the most frequent, closely followed by scirrhous.

A point of interest in this connection is whether the primary tumor in the pancreas is really of pancreatic origin, or whether many such growths are not secondary to an overlooked focus in the pylorus or duodenum.

Oliviere<sup>9</sup> in a very careful study, holds that a neoplasm apparently primary in the pancreas may have had its origin in the duodenum, and that only the most painstaking microscopic study can differentiate the two.

Fähndruck<sup>10</sup> in an inaugural dissertation reports several

The practicability of blocking the thoracic aorta sufficiently to favor the gradual deposition of the clot in an aneurism situated in front or behind the plication, and to obtain this stenosis or constriction in a safer and more certain way than can be accomplished by ligatures or bands of metal or other material, which constrict the vessel circumferentially and over a comparatively narrow area.

Second: To reduce the calibre of the fusiform, cylindrical, or saccular aneurisms, that are otherwise inoperable, by reinforcing their walls by plication.

In addition to plication, we have thought of the possibility of strengthening and supporting the walls of rapidly expanding aneurisms, which are otherwise inoperable, by wrapping them at the weakest points with free flaps of fascia (aponeurotic grafts), as the most available material, which we would suture to the sac. In other places this is a good grafting material, but we have not yet sufficiently tried it to permit us to express a definite judgment as to its value; but this is an afterthought which has only been suggested by the recent work of Nassetti and of Halsted. Thus far the method of exclusion or short circuiting, applied to aneurismal areas situated in the aortic tract, by means of direct anastomotic connections or with transplanted vessels, provisional or glass tubes, by the ingenious procedures devised by Carrel and more recently by Jeger and Schuppelmann in their experimental work, has no application to surgery. No method of anastomosis can provide for the maintenance of the indispensable cerebral circulation whenever the carotid bearing section of the arch is excluded from this vessel.

In the abdominal aortic tract, the possibility of transplanting the great visceral trunks, either by the method of Carrel, or by the very ingenious and successful technic of Jeger and his associates, which has led to such remarkable results in the transplantation of the renal vessels, must be recognized as an experimental fact which may soon have very decided application in the surgery of abdominal aneurism. This new development in the technic will permit of the obliteration of an aneurismal sac by aneurismorrhaphy or its extirpation, pro-

## SUBDIAPHRAGMATIC ABSCESS.\*

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A SUBPHRENIC abscess may be defined as a localized collection of pus situated immediately below, and in contact with, the diaphragm, or only separated from it by the peritoneum.

In order to better understand the localization of pus in this region a brief review of the anatomical relations of the viscera which occupy it will be of assistance.

If the organs are removed from the abdominal cavity, leaving only the parietal peritoneum, it will be seen that the reflections of peritoneum entering into the formation of the lateral ligaments of the liver, the gastrohepatic omentum, the gastrosplenic omentum, the gastrophrenic and the costocolic ligaments, divide the diaphragmatic area into an upper anterior and a lower posterior part. The space above this transverse chain is divided into right and left anterior spaces, both being intraperitoneal, by the falciform and round ligaments of the liver, while the part below it is divided by the reflection of the peritoneum to the duodenum and the hepatic vessels into a right and left posterior intraperitoneal space, both lying above the transverse mesocolon, but communicating with each other through the foramen of Winslow; the former being known as the subhepatic fossa or the right renal pouch, and the latter, as the cavity of the lesser peritoneum.

H. L. Barnard, in his admirable paper on this subject, pointed out that in the presence of infection the viscera of the upper abdomen would adhere to each other and to the abdominal wall in such a manner as to form the lower and anterior limits of these spaces in which pus could accumulate, forming

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\* Read before the Philadelphia Academy of Surgery, March 3, 1913.

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rests upon the left crus of the diaphragm and the pancreas; to the left is the spleen, to the front is the liver, the lesser omentum, and the posterior wall of the stomach; to the right are the duodenal vessels, bile ducts, and foramen of Winslow.

An extraperitoneal subphrenic abscess is formed on either side by infection of the retroperitoneal tissues. On the right side the pus finds its way between the two layers of the lateral ligaments and the coronary ligament, thence forward to the falciform, often as far as the umbilicus, while on the left side the pus dissects up the peritoneum from the surface of the diaphragm in order to make room for the abscess between them.

*Etiology.*—Subdiaphragmatic abscesses may be, but are seldom, primary. They usually follow some lesion producing direct contamination of the peritoneum in this situation, or by the extension of a suppurative process distally situated, either by contiguity, continuity, through the lymphatic vessels or through the blood currents.

The most frequent cause is probably perforation of gastric or duodenal ulcers, while infectious processes occurring in the abdominal or thoracic organs are common, among which, in the order of frequency, are appendicitis, suppurative conditions of the gall-bladder, liver, pelvic organs, thorax, and spleen. They occur in septicæmia and pyæmia. In one of the cases reported here it was tubercular, secondary to a thoracic lesion.

*Symptoms.*—The previous history is usually that of the condition which ultimately gives rise to the abscess. If it originates from a gastric or duodenal ulcer, a history of digestive disturbance, pain associated with the taking of food, etc., would likely be obtained. The onset may be sudden or insidious; if intraperitoneal it is apt to be acute and violent when due to a perforating ulcer, but not always, as it may be subacute when the ulcer perforates through a small opening. During the course of a septic condition the formation of the abscesses may be largely masked by the preponderance of

in relation to ulcer. The point of the duodenum above the common duct, namely about the first four inches, is in reality a part of the stomach and should be so considered. This part of the alimentary tube together with the stomach proper is derived from the foregut; has the same blood supply as the rest of the stomach, namely through the cœliac axis; the same nerve supply through the pneumogastrics, and sympathetics, and the same lymphatic drainage. Its mucous membrane is thin and granular, it contains no valvulae conniventes, and does contain Brunner's glands which are identical in structure with the hydrochloric acid glands of the stomach. Its functions and diseases are those of the pyloric region of the stomach. The proximal duodenum does not exhibit peristalsis and in this respect is like the cardiac end of the stomach. Like the cardiac end also it serves as a mixing chamber for the food and digestive secretions, being acted upon by respiratory movements of the diaphragm through the liver.

A new nomenclature might designate various parts of the stomach as follows: It is divided into two parts, the left or cardiac portion and the right or pyloric portion, by a line passing from the incisura angularis on the lesser curvature to a point opposite on the greater curvature. The cardiac portion would then be subdivided into the cardiac fundus, cardiac sac, or cardiac chamber, and the body of the stomach. The pyloric portion would be subdivided into the pyloric vestibule, pyloric canal, and pyloric fundus, pyloric sac, or pyloric chamber, at present designated as the proximal duodenum (Mayo).

The fundus and body of the stomach are supplied by the gastric and splenic arteries, while the whole pyloric portion, including the pyloric chamber down to the common duct, is supplied by the hepatic artery through its pyloric and gastro-duodenal branches. These are all derivatives of the cœliac axis. The small intestine beyond the common duct gets all of its blood supply through the superior mesenteric arteries. Even the inferior pancreaticoduodenal branch of this vessel



The fundus of all organs is notoriously deficient in blood supply as compared to other parts of the organ. Witness for example the gall-bladder, the urinary bladder, the uterus, and even the fundus of the cardiac end of the stomach. Mayo's anaemic spot is located in the fundus of the pylorus and Wilkie, from a study of 40 specimens with reference to the arterial supply of the pyloric area, found the first two inches of the duodenal portion of the pylorus markedly deficient in blood supply as compared with the rest of the region. This investigator has shown that the first two inches of the duodenal portion of the pylorus is supplied by the supraduodenal artery which though usually a branch of the gastroduodenal, sometimes arises from the hepatic and other arteries in the neighborhood. The anastomosis of the supraduodenal with the surrounding arteries is very imperfect and often this is a true end artery with no anastomosis. The first two inches of the duodenal portion of the pylorus is therefore designated as the critical area on account of its deficiency of blood supply and its notoriously common seat for ulcer formation.

Moreover, the first two inches of the proximal duodenum is freely movable whereas the area beyond is comparatively fixed. It therefore represents the junction of a fixed and movable portion. The tendency for infection to be located at such a junction is strikingly manifested by the localization of tuberculosis of the spine at the dorsolumbar junction. Moreover in the pylorus this critical area represents the junction of two curves, the ascending and the descending portions of the proximal duodenum. The tendency for localization of infection at the meeting place of two curves is exhibited by other structures throughout the body.

The dome of this region is commonly the point affected and the dome of all hollow organs is relatively poorly supplied with blood. The slight local anaemia incident to vascular sclerosis may account for the greater tendency to ulcer in men as compared to women. Ulcer is in reality local circumscribed gangrene and men are more frequently the victims of gangrene than are women though no more commonly the

toward the right, while its left boundary would extend from the umbilicus to the left costal margin, and the left base would be the situation of the altered physical signs.

Should the abscess be localized in the subhepatic fossa, there would be tenderness and rigidity below the costal margin, extending downward and posteriorly toward the crest of the ilium.

If the lesser peritoneal cavity is the situation of the abscess the diagnosis becomes more difficult; an accumulation of pus here may present forward in one of several places, between the stomach and liver, the stomach and colon, the stomach and spleen, or below the colon. Altered physical signs at the left base are sometimes present.

Right-sided extraperitoneal subphrenic abscesses are caused most frequently by retrocolic appendicitis, infections of the liver, pancreas, or the kidneys.

The onset of the symptoms is associated with the systemic evidences of infection and are usually gradual. There are, of course, no symptoms of peritonitis, very little if any pain or tenderness, as these retroperitoneal spaces may be considered silent areas, just as infectious lesions of the brain or liver substance give rise to little or no pain; when, however, the abscess extends into the lumbar region, or advances along the falciform ligament anteriorly, tenderness is more easily elicited. In the latter the abscess may point in the middle line between the ensiform cartilage and the umbilicus, and be open in this situation without entering the peritoneal cavity. The signs at the right base are only marked in a well developed abscess, if the left lateral ligament is invaded; the left base may also show altered physical signs.

The left extraperitoneal subphrenic abscess, originates usually from the kidney, pancreas or spleen, and is apt to present in the lumbar region, but occasionally it dissects the peritoneum from the under surface of the diaphragm, under which circumstances there may be tenderness in the right

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the region of the gall-bladder, which radiated to the right shoulder. He was nauseated but did not vomit until after salts had been administered to him. He was admitted to the Medical Ward of the Jefferson Hospital, August 11. At that time he complained of a dull, aching pain over the gall-bladder, much less severe than at the onset; temperature  $100\frac{3}{5}^{\circ}$ , pulse 106, and a leukocytosis of 18,400. I saw the patient August 15. At this time his temperature had fallen to  $99^{\circ}$  and the leukocyte-count was 10,600; the pain was described as much less tender upon physical examination. By deep palpation a moderate amount of tenderness was elicited in the region of the gall-bladder, still less over McBurney's point, and no appreciable rigidity of the recti muscles. I concurred in the diagnosis of cholecystitis, which was subsiding, and advised his transfer to the Surgical Ward.

On August 18, his leukocytes rose to 14,600, and the following day he was sent to the Surgical Ward. I saw him on the morning of the 20th. At this time a distinct mass could be felt reaching a little above the level of the umbilicus on the right side. I then felt that we had a high posterior appendix to deal with and operated the same day. Upon opening the abdomen the gall-bladder and ducts were normal, but the ascending colon was pushed forward by a mass behind it and was bound down by adhesions to the outer side. The general peritoneal cavity was packed off and the adhesions broken up, liberating a moderate amount of pus; a necrotic appendix was lying behind the colon and reaching high up toward the gall-bladder, this was removed and the abscess drained through the rectus wound, posterior drainage was not thought necessary.

Following the operation the patient ran a slightly elevated temperature, going as high as  $101^{\circ}$ , but became normal on the 10th day. From then on it gradually rose again and by the twenty-fourth day assumed the septic type, accompanied by chills. Frequent examination failed to find a reason to justify further operative interference. The patient had several chills on succeeding days, and continually lost weight, and, while there was no pain, he complained constantly of great weakness. The wound continued to discharge pus rather freely and on the forty-third day after the operation friction sounds were heard at the right base, two days later it was evident that a pleural effusion existed.

jaundiced, constipated and a small mass developed on the right side in the gall-bladder region.

Dec. 6, 1911, the writer was called into consultation and the following conditions were noted:

A well nourished woman, suffering a moderate degree of abdominal pain but not exhibiting any evidences of shock. She was moderately jaundiced, the sclera deeply stained, the tongue was pale and flabby, the pulse full and strong. There was no history of sweats but occasional slight chills were noted; the temperature rose from normal in the morning to 100° F. at night, there was some degree of nausea and distaste for food, but no vomiting. Pain was considerably increased immediately after eating solid food. The heart and lungs proved negative to physical examination, the blood pressure was 130 mm.

The abdomen was slightly distended but soft and presented a small rounded mass in the right nipple line, just below the costal margin; the mass moved synchronously with the respiratory excursion, was semi-fluctuating in character and was very tender, pain on palpation was distinctly transmitted to the left lumbar region, high up.

The stomach could be indefinitely outlined and revealed no evidence of gross change.

The pelvic organs were normal, the urine was bile-stained, negative for sugar, albumin and casts. There was no fat present in the somewhat pale stool. After further consultation with Dr. Tilton and Dr. E. H. Stevens, of Cambridge, a diagnosis of cholelithiasis was made and the patient removed to the Copp Hospital for operation. It may be noted that she walked without discomfort down a flight of stairs to an automobile and rode six miles to the hospital where she mounted another flight of stairs without exhaustion.

Under ether anaesthesia, the gall-bladder was exposed by an incision parallel to the costal margin. Upon opening the peritoneum the palpable mass was found to consist of rolled up omentum, densely adherent and undergoing fat necrosis. The entire upper segment of the abdomen showed extensive fat necrosis and the structures were so densely adherent that relations were indistinguishable. The gall-bladder was collapsed and pale and contained no stones. On account of the violent hemorrhage encountered when adhesions were separated, it was

region. Operation was performed, shortly after admission, through a Kammerer incision; a large appendiceal abscess was opened and a rather long retrocolic appendix was removed. The abscess cavity was then drained through the anterior wound.

The subsequent course of this patient very closely resembled the other appendix case, just described; the temperature gradually became septic in character and the patient lost weight and strength. Frequent physical examination failed to disclose any accumulations of pus or evidence of peritonitis; drainage from the original wound was still quite free.

The day following the autopsy on Case II, I determined to establish posterior drainage in this case and to explore the region in which the abscess had been found in the previous case. Using the triangle of Petit as my point of entrance I connected this with the original wound but failed to find that this liberated any accumulation of pus. I then passed a long curved pair of haemostats up the outer border of the right kidney, to its upper pole, and in this region, or a little beyond, entered an abscess containing about five ounces of pus. The haemostats were admitted their full length without meeting with any resistance; the lower end and posterior margin of the liver could be felt in the wound, so that the abscess must have been in, approximately, the same position as in Case II. The patient's temperature gradually fell, reaching and remaining normal on the tenth day; her recovery was uninterrupted although slow, probably due to her advanced age.

CASE IV.—A lad, seven years of age, had complained of pain in the left hypochondrium for the last fifteen months; recently the parents noticed a protrusion of the ribs on that side. Upon admission, Aug. 20, 1912, the left side of the thorax was found to be distinctly bulging from the seventh to the eleventh rib in the anterior axillary line; the breath sounds over this area were normal but by deep palpation a mass could be felt, about in the position one would feel the spleen or a little above it. The radiogram showed a shadow in this position and also showed evidence of tuberculosis in the lungs, consisting of an increase in the amount and the density of the fibrous tissue.

Believing that I had an extraperitoneal subdiaphragmatic

*Liver*.—Is large and voluminous, on section presents a grayish green, pale appearance, the substance somewhat greasy to the touch. Near the beginning of the middle lobe and starting in the hilum, around one of the large branches of the left portal vein, the periportal structures are greatly thickened, of a whitish, nodular appearance, a large number of droplets of purulent material being expressed from the spaces around the vein. The vein itself shows roughening and thickening of the intima, which is covered by a thin film of whitish material. The periportal process infiltrates the liver substance bordering on it.

*Gall-bladder*.—Not remarkable except as before described.

*Spleen*.—Very large, about twice normal size. Capsule tense, of livid violet hue. On section substance is very soft and diffluent, follicles appear as irregular grayish bodies averaging 2 mm. Trabeculae not visible.

*Kidneys*.—Both kidneys show normal amount of perinephritic fat. Capsule strips with slight difficulty leaving a very finely granular surface. On section somewhat pale. Pelvis and ureters normal.

*Aorta*.—Shows a few yellowish elevated plaques in its lower part.

*Anatomical Diagnosis*.—Carcinoma of the stomach with ulceration. Carcinoma of the body of the pancreas. Purulent infection of periportal spaces in one branch of vein in liver. General acute fibrino-purulent peritonitis with extensive fat necrosis. Chronic adhesive peritonitis in right hypochondrium and around pancreas. Operation wound and trochar puncture.

*Microscopical Examination*.—Sections taken from affected regions of stomach and pancreas show a markedly infiltrating carcinoma, in some places it being of an almost pure medullary type, while in others the fibrous stroma is much more marked. Necrotic areas are very abundant, abscess cavities are numerous, polymorphonuclear leucocytes are seen in large numbers, being also found infiltrating the stroma around these areas. The pancreatic substance shows a fairly well marked increase of fibrous tissue between the acini.

*Diagnosis*: Carcinoma of stomach, infiltrating pancreas and surrounding lymph nodes. Chronic interstitial pancreatitis.

*Liver*: Section shows very marked fatty infiltration around central veins.

Sinusoids contain many endothelial leucocytes.

*Spleen*: Follicular structure is almost obliterated. Sinuses distended and filled with fine granular coagulum and containing many endothelial cells and several polymorphonuclear leucocytes. Blood pigment abundant in these cells. Capillaries congested.

*Diagnosis*: Acute splenic tumor (acute oedema, congestion and hyperplasia).

A summary of the foregoing case history, brings out the rather surprising fact that there were present four of the more grave affections of the upper abdomen existing simultaneously, three of them presumably superimposed upon the fourth.

toneum by gauze packs introduced through the abdominal wound.

When the physical signs are well marked at either base the lung is apt to be displaced upward and the diaphragmatic and parietal layers of the pleura are frequently adherent, or in contact, so that they may readily be united. Under these circumstances the transpleural route is thought, by some, to be the best. This may be conducted in two stages, the first of which consists in resecting a rib, or ribs, and uniting the pleural surfaces and a day or two later exploring beyond these.

It is permissible to precede this operation by an exploring needle, provided the operation is to follow at once, keeping in mind the danger of infecting the pleural cavity; this danger may be lessened by leaving the needle in place until the pleura is incised and, if necessary, the two surfaces united by sutures.

This method has the very great disadvantage of endangering the pleura, both to the infection or to the formation of pyopneumothorax, and the difficulty in some cases of maintaining adequate drainage. On the other hand, there are very few subdiaphragmatic abscesses that cannot be dealt with satisfactorily by one or the other method, that is, by direct incision, as in my first case, or by a loin incision, and when necessary associated with an opening in the abdomen.

In reviewing the reported cases, it would seem that the intraperitoneal abscesses form pus much more rapidly than the extraperitoneal ones do, the physical signs are detected earlier, tenderness and rigidity are apt to be present and well marked, even if the abscess has not reached large proportions, the infection is less apt to pass beyond the original limits of the abscess and thorough drainage is more easily accomplished.

The retroperitoneal abscesses are more insidious in their onset, are detected with greater difficulty, the infection is liable to extend far beyond the walls and into regions where it is impossible to follow.

In neither of the extraperitoneal cases, II and III, was it possible to make a positive diagnosis of abscess, and had I not

development in the pancreas. Bode thinks it possible that the carcinoma may have developed in an old interstitial pancreatitis.

Syms<sup>2</sup> reports an interesting case in a male twenty-four years of age. For one year there were noticed slight stomach symptoms; three months before these symptoms had grown more severe and were attended with some nausea and occasional vomiting, jaundice developed, with pale stools, the urine bile stained and there was slight fever. On examination there was found a rigid abdomen with tenderness in the epigastrium and marked pain in the upper left lumbar region. Upon operation the gall-bladder was found distended but there was no disease of the biliary system. A firm, nodular mass was attached to the posterior wall of the stomach, extending from behind the duodenum well across the posterior gastric wall. The gall-bladder was drained, but the patient died in four days.

Autopsy showed the gall-bladder and ducts free from disease. There was present a large carcinoma involving the pancreas, the posterior wall of the stomach and the suprarenal on the right side. The jaundice was due to the compression of the duct.

Körte<sup>3</sup> reports a case in a woman of forty-one, who for two years had had indefinite symptoms referred to the stomach, with slight loss of weight. She was suddenly seized with severe pain in the upper abdomen and breast, vomiting and diarrhoea. The abdomen was distended; at the epigastrium, above the umbilicus and a little to the left was a tender, fist-sized tumor, which did not move with respiration and presented a small area of fluctuation. On operation a large abscess was found between the layers of the gastrocolic omentum and attached to the stomach and colon. Its contents were thick pus, particles of fat and necrotic tissue. The wound was drained, the patient dying two months after operation. Autopsy showed a mass of adhesions in the upper abdomen and a well advanced carcinoma of the pylorus, to which is firmly attached the head of the pancreas, which is penetrated by the carcinoma.

It has been proved beyond doubt that a close nervous and chemical relationship exists between the stomach and the pancreas and that if the sequence of this mechanism be altered by disease, changes may result in the function of either or both organs.

According to Howell<sup>4</sup> the order of digestive stimuli in the stomach and pancreas is as follows: the acid of the gastric juice, upon reaching the duodenum produces the material called secretin, which is in turn absorbed by the blood and carried to the pancreas where it stimulates that organ into activity. There is also present and active a nervous mechanism contained in the secretory fibres of the splanchnic and the vagus.

# EXPERIMENTAL ANATOMIC AND PHYSIOLOGIC OBSERVATIONS BEARING UPON THE TOTAL EXTIRPATION OF THE COLON.\*

BY AUGUST SCHACHNER, M.D.,  
OF LOUISVILLE, KY.

WHEN we consider the arrangement by which 20 or more feet of small intestine are being supported through a peritoneal attachment measuring five inches (vertebral border of mesentery); when we think of the inguinal region as the lowest and weakest portion of the abdominal wall, and the frequency with which hernias result from the gravitation of abdominal contents against this lowest and weakest point; when we examine the costal arrangement by which it becomes necessary in respiration to raise the costal cage against gravity; when we compare the darkened lungs of the human subject with the clean pink lungs of the quadruped living under the same conditions as a proof of how unequal the ciliae are in their efforts to lift the dirt and bacteria laden mucus against gravity; and when we watch the pathetic efforts of the tubercular subject to raise against gravity his expectoration, we get the full swing of the disadvantages of the upright position.

These are but a few of the disadvantages as pointed out by Pohlman, and more fully set forth by Wiedersheim in his excellent work, "Der Bau des Menschen."

That man advanced in the evolution we freely concede, but we must not be unmindful of the price that was paid for the advancement, and that will continue to be paid until, through the natural process of evolution or some artificial means, a better adaptation to the condition can be arranged. The work of Mr. William Arbuthnot Lane, which has extended over a period of more than ten years, and his writings

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\* Read before the Southern Surgical and Gynaecological Association,  
December 18, 1912.

cases wherein apparently primary pancreatic cancers had their true source in a small tumor in the gastric mucosa.

The conclusions gathered from a review of the foregoing are: that secondary invasion of the pancreas is a somewhat infrequent sequel of pyloric or duodenal carcinoma and that in a certain group of cases, where the pancreas is attacked early in the course of the disease, there may arise a mutual functional compensation between stomach and pancreas, which permits both organs to satisfactorily perform their duties, with a decided absence of symptoms of disease of either, even though there may be extensive destruction of tissue.

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Shall the ileum be connected with or without the additional step of colectomy? Shall the attachment be made end-to-end, side-to-side, or end-to-side? To these belong the difficulties of properly selecting the cases suitable for the procedure and the operative details common to every intra-abdominal operation, as minimizing adhesions, avoidance of shock, and lastly, infection directly or indirectly through imperfect suturing.

A series of experiments upon dogs was conducted by the writer with the hope of possibly shedding a little light upon the debatable operative side of the question.

To avoid too much encroachment upon time and space we omit details of each experiment.

Only those methods were tried that seemed desirable, namely, side-to-side, end-to-end and end-to-side. The invagination was tried in the end-to-end because it seemed suitable in view of the smaller circumference of the small intestine as compared with the receiving lumen of the large intestine.

The end of the small intestine was placed parallel with the end of the large intestine and one-half of the circumference united by means of a through-and-through stitch with the corresponding half of the large bowel.

The traction sutures, the one at the mesenteric attachment and the other at the opposite point, were introduced from within, securing a good, strong purchase at these points and leaving the one end of each suture long and armed with a milliner's needle. The needles were pushed through the wall of the large intestine at a point about 2 inches beyond the line of suture, and used to aid in effecting the invagination. Following this the remaining half was closed by means of a Connell stitch. By pushing upon the small intestine from above, and pulling from below by means of the traction sutures, an invagination was effected, bringing broad peritoneal surfaces together.

The invagination was made permanent by the application of two continuous seromuscular sutures, one for each half of the intestinal circumference. The traction sutures were severed close to the intestinal wall, while traction was being made which resulted in the disappearance of the end within the lumen of the intestine. The minute punctures were touched with 95 per cent. carbolic acid, followed by alcohol, and buried by one or two Lambert sutures.

Lateral anastomoses were made in two ways: in the one the blind end was left needlessly long beyond the opening in the proximal limb; and in the other this was reversed, *i.e.*, made as short or without any blind

discrete abscesses, separated from each other and from the rest of the abdominal cavity.

The right anterior intraperitoneal space is bounded, behind, by the right lateral and coronary ligaments of the liver, below, by the upper surface of the right lobe of the liver, the falciform ligament is to the left, while its lower anterior limits are often formed by adhesions between the margin of the liver and the anterior abdominal wall; however, if the infection arises below, as from an anterior perforating gastric ulcer, the lower boundaries of the abscess are formed by adhesion between the surface of the stomach, colon or great omentum to the anterior abdominal wall. The left anterior intraperitoneal space is limited, above, by the diaphragm, behind is the left lateral ligament and the diaphragm, to the right by the falciform ligament, the reflections of the peritoneum entering into the formation of the gastrohepatic and gastrosplenic omentum, below and to the right, by the stomach, which, together with the great omentum becomes adherent to the anterior abdominal wall, shutting the abscess off from the peritoneal cavity below, while to the left is the spleen and the left abdominal wall.

The right posterior intraperitoneal space, or the subhepatic fossa, is overhung by the liver and the gall-bladder, which form its anterior wall behind, it is limited above by the right lateral and coronary ligaments, while, posteriorly is the right crus of the diaphragm and the right kidney; to the left is the duodenum, the bile ducts, vessel to the liver, and the foramen of Winslow, through which this space communicates with the lesser peritoneal cavity; while along the lower margin of the left lobe of the liver in front and the anterior surface of the stomach a narrow communication exists with the left anterior intraperitoneal space. On the right side infection may find its way around the right ligament, as well as around the anterior margin of the liver to the right anterior peritoneal space and below it communicate with the right lumbar fossæ. The left posterior intraperitoneal space, or the lesser peritoneal cavity,

following: In a moderate sized brindle bull dog the mid-point of the descending colon was divided. Its distal end was closed by invagination, and its proximal end brought through and sutured to the peritoneum in the mid-line. The end beyond this peritoneal line of suture was passed between the separated fibres of the left rectus in its middle and made to emerge on the surface at a point about one inch external to the outer border of the rectus. An ileorectostomy was made between the ileum, four inches beyond the valve, and the large bowel as near the anus as conditions would permit. The ileorectostomy opening was about two inches, which for the size of the animal was unusual.

It will be seen that an effort was made to favor the passage of the intestinal contents through the anastomosis and in the natural way through the short rectum by making the opening large and the distance between the anastomosis and the anus short, the line of least resistance.

On the other hand, an effort was made to retard the passage through the other course by compelling it to pass the ileocaecal valve, traverse the greater distance, and overcome such resistance as the above described arrangement at the artificial anus would offer. The result was that practically all the movements passed through the ileocaecal valve, traversing the longer distance, overcoming the obstacles in the abdominal wall; and were discharged through the artificial anus instead of the natural one—the gastro-enterostomy story over again.

The few movements that passed the natural anus were fluid or semi-fluid with minute evidences of blood for at least 11 weeks after the operation.

Those that passed the artificial anus were formed and had the appearance and consistency common to the normal movement of a dog. The nutrition of the dog for six weeks was impaired. This was attributed more to the habits of the dog to lick his wounds. We were not entirely successful in preventing this.

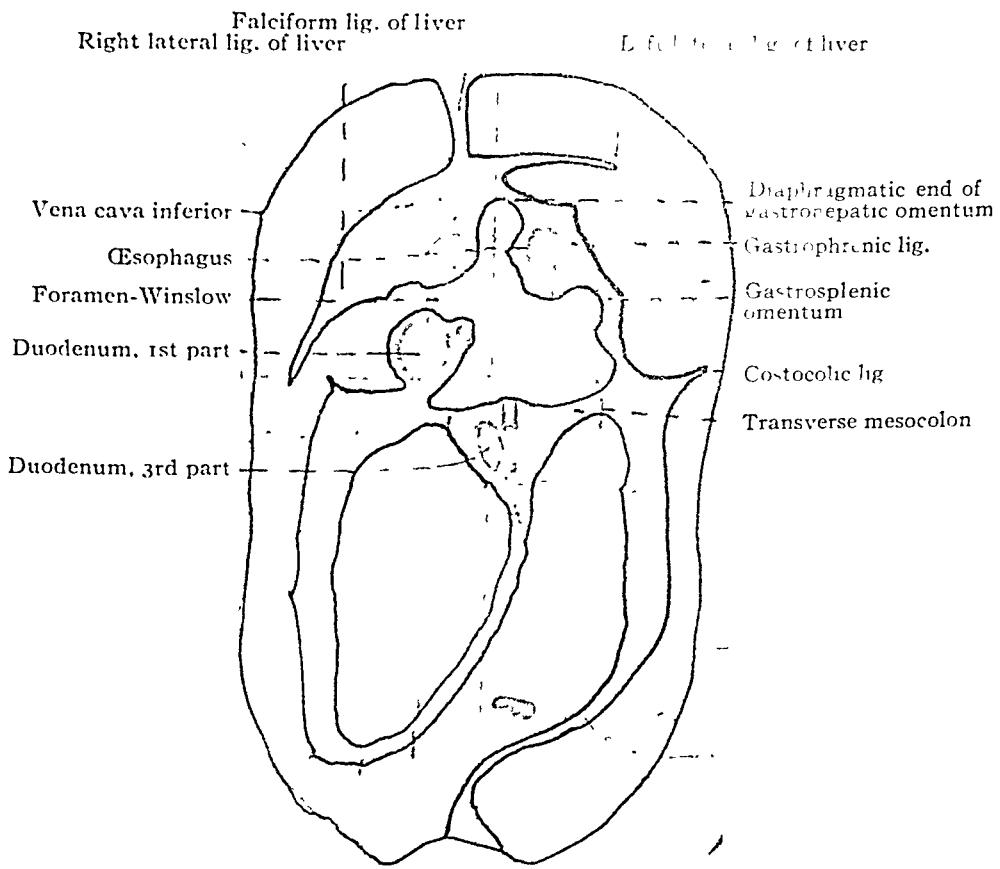
The local disturbance and impaired function at the site of the anastomosis played the principal part in the interference with his nutrition. His nutrition finally returned to normal.

Such movements, few in number, and at times only that passed by the natural anus, were indicative of a proctitis at least up to 11 weeks following the procedure. The other dogs did not show any indication of an interference with the nutrition. If there was any undue thirst, we failed to observe it. The movements were all semisolid at the beginning but without any indication of proctitis or other inflammatory disturbance such as occurred in the dog with the artificial anus. In the course of about two weeks, the movements became formed. Up to three months after the anastomoses they remained formed but were never in that desiccated state common to the movements of this animal.

The end-to-end union gives the most perfect functional results (Cannon and others).

The chances for infection when carried out by any of the

FIG. 1.



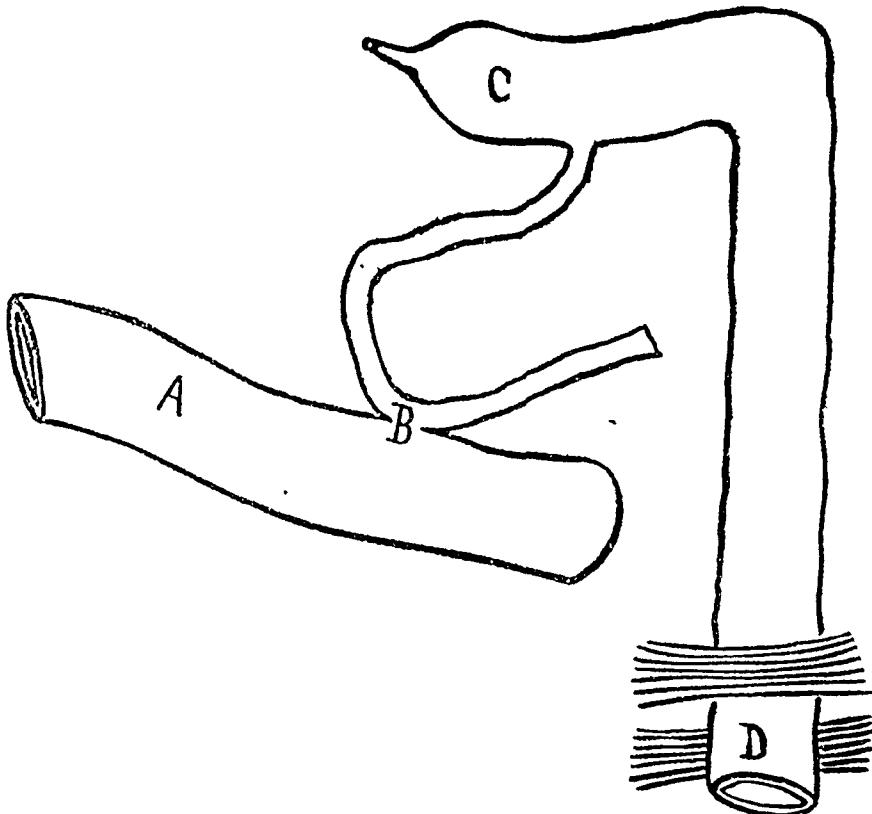
After Delépine, showing lines along which the peritoneum leaves the abdominal wall to invest the viscera. (From Gray's Anatomy, page 1269, Fig. 876, 17th edition. By Da Costa and Spitzka.)

which results in a condition not unlike the end-to-end anastomosis.

The end-to-end union performed in the usual manner, has practically all the advantages of both without the disadvantages of either.

The symptoms and signs of intestinal stasis as well as the pathologic anatomy, have been presented by several writers in the recent current literature.

FIG. 3.



Ileorectostomy with artificial anus. A, rectum; B, ileorectostomy; C, cæcum; D, art'ificial anus just beyond the separated fibres of the rectus muscle.

We forego repeating what is clearly set forth by Mr. Lane upon the pathology and the complete clinical report by Mr. Chapple of the end results of 50 cases. These two papers can especially be commended, as they represent the views as expressed by Mr. Lane and his associate. (*British Med. Jour.*, April 12, 1911.)

these processes. The amount and character of pain are variable; it is generally present early, at the site where the abscess ultimately forms.

Tenderness and rigidity accompany the onset of a local peritonitis, but as the abscesses become walled off they lessen to some extent. The temperature in these cases, if the abscess is well localized, may be very slight, but sooner or later it becomes septic in character, and may be accompanied with rigors and sweats. The patients become anaemic, lose weight and strength rapidly; often their only complaint is extreme weakness. Leucocytosis is always present, but varies with the degree of the infection and the resistance of the individual. In about two-thirds of the cases an abdominal mass can be detected; it is dull to percussion, tender and firm if due to inflammatory tissue; while signs of fluctuation, slighter tenderness; and sometimes tympany is present, if the pus is due to a gas-producing organism. Displacement of the liver depends upon the formation of a line of adhesion between the liver and the anterior abdominal wall, which is usually the case, when the infection progresses from the posterior part of the upper surface of the liver to its anterior margin, in this case the liver does not descend with respiration.

As pus accumulates between the liver and the diaphragm the lung is displaced upward and more or less compressed, thus giving rise to altered physical signs at the right base, and sometimes accompanied with the plastic or serous pleurisy or a localized bronchitis. However, if an abscess is situated in the right intraperitoneal space and the line of adhesions does not form between the liver and the abdominal wall, or the abscess originates below the liver margin it would assume a triangular shape which would extend from the ensiform process to the umbilicus by a line convex to the left representing the falciform ligament and from there to the right costal margin. In an abscess situated in the corresponding space on the left side, the mass would have its right boundary convexed

infancy and should become as much a part of personal hygiene as are ablutions and baths."

In closing, I wish to emphasize that the problem is comprehensive enough to accept all the assistance it can through gymnastics, bandages, regulation of diet and habits and still furnish an abundant per cent. of human wreckage, as Mr. Lane expresses it, for the surgeon to attempt to reclaim.

I wish to convey my thanks to Dr. Benjamin J. Lammers and Mr. Morris Flexner for valuable assistance rendered me in this work.

NOTE.—Since the meeting of the Southern Surgical and Gynæcological Association, held December, 1912, I have received a communication from Mr. Lane defining his position upon the question of intestinal stasis and cholectomy. In view of the growing interest in this question, I deem it fair and proper to append with his permission, his views, as follows:

"I do not think my treatment has changed. I believe that if the patient is at all wasted, and the colon is distinctly static, it is far better to remove the large bowel. In other words, when the removal of the large bowel exposes the patient to but little added risk, I prefer to remove it. The result of removal is far better than that of short circuiting. At the same time, I do a great number of operations of short circuiting, namely, putting the ileum into the pelvic colon immediately below the last kink for tubercle, rheumatoid arthritis, Still's disease, neuraglia, changes in the thyroid associated with stasis, as exophthalmic goitre, diverticulitis, etc., for which cholectomy is not called for. If in these cases I get trouble subsequently in the cæcum, which is rare, I remove the large bowel. I do a large number of short circuitings, as the conditions benefited by it in an extraordinary manner are *very numerous*. Those calling for removal of the large bowel are comparatively rare. I have not lost a patient in my female ward at Guy's Hospital from short circuiting or from removal of the large bowel for, I think, three years. Men are more difficult and perhaps more dangerous."

hypochondrium, with symptoms of compression of the left base.

Three of the following cases occurred at the Jefferson Hospital in the service of Doctor John H. Gibbon, to whom I am indebted for the privilege of operating upon them and of reporting them.

CASE I.—A woman, sixty-three years of age, who had been ill for six weeks with what had started as gall-stone colic. She commenced to have fever soon after the onset of the illness and for the four or five days preceding the operation had rigors, with a temperature of  $104^{\circ}$  to  $105^{\circ}$ , followed by sweats. The patient was evidently very ill, and upon examination there was found a diffuse cellulitis extending over the lower part of the thorax, the right side of the abdomen as far as the umbilicus, and spreading from there to the right iliac crest and loin. A little to the right of the costoxyphoid angle there was a fluctuating area about two inches in diameter.

An anæsthetic was administered and an incision made over this fluctuating area which liberated a large quantity of pus. A sinus was found leading through the abdominal wall to a secondary abscess in the subhepatic fossa, containing between a pint and a half and two pints of pus. On account of the extensive cellulitis it was not deemed wise to open the general peritoneal cavity, and after placing a gauze pack covered with guttapercha tissue at the base of the gall-bladder, the operation was terminated. There were no gall-stones liberated with the pus and none discharged afterward. The patient made an uneventful recovery and is reported to be well at this time, some eighteen months after the operation.

There is some doubt in regard to the origin of this infection, but I am inclined to believe that subhepatic fossa became infected from a cholecystitis and from there the infection spread to the right anterior intraperitoneal fossa around the anterior margin of the liver.

CASE II.—W. C. F., age thirty-three, male. The family and previous history had no bearing upon the present illness. On August 9, 1911, the patient was seized with very severe pain in

## DIVERTICULITIS OF THE SIGMOID.

BY JOHN DOUGLAS, M.D.,

OF NEW YORK.

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THE development of the recognition of diverticulitis of the intestine as a definite clinical disease with its own pathology and symptomatology is of considerable interest. The existence of diverticula of the intestine has been known for over a hundred years, but less than ten years ago in *Nothnagel's Encyclopedia* (edition 1904) in writing of acquired diverticula of the intestine the statement is made "as these lesions are chiefly of anatomic interest and have very little clinical significance, only a few general remarks will be made on this question."

Sixty years ago Virchow<sup>1</sup> described areas of localized peritonitis occurring on the colon and causing adhesions. This inflammatory process he considered to be due to constipation. For many years little attention was paid to these observations. In 1889, Windscheid<sup>2</sup> reported three cases of acute inflammation of the ascending colon. Graser<sup>3</sup> ten years later was the first to prove the relationship between diverticula of the colon and these inflammatory processes of the intestinal wall.

In 1904 Beer,<sup>4</sup> in an admirable article and review of the then meagre literature almost entirely in the German medical journals, called attention to the relation between the various pathological reports and clinical findings. In 1907 Brewer<sup>5</sup> reported on six cases of left-sided abdominal suppuration, in two of which the direct relation between diverticula and the inflammation were demonstrable, in the other cases problematical. In the same year Mayo<sup>6</sup> reported five cases and collected eighteen cases from the literature, and in 1908 Telling<sup>7</sup> analyzed reports of one hundred and five cases.

The patient died of exhaustion on the forty-seventh day following the operation.

*Autopsy.*—Pleura: On the right side shows a few adhesions at the apex; the cavity contained 60 c.c. of slightly blood-tinged fluid.

Peritoneum: To the right of the umbilicus the intestines were knotted together by numerous adhesions, which were separated with difficulty; these extended up to the under surface of the liver, and when broken up, this region shows numerous small pockets of pus, a large pocket behind the ascending colon communicates with a sinus in the abdominal wall, a branch of this sinus extends up the muscle in the abdominal wall for a distance of 10 centimeters. The liver extends two finger's breadth below the margin of the ribs in the midclavicular line; the liver is normal in size, somewhat soft in consistency. On the posterior surface of the right lobe there is a necrotic area 13 cm. in diameter and 1 cm. deep; it is covered by shaggy, grayish-yellow tissue, posterior to the gall-bladder and between the right and the left lobe the finger can be passed up into the liver tissue into a cavity 5 cm. in diameter, filled with necrotic material and pus.

Kidneys: The right kidney measures 13 x 5 x 4 cm. and resembles its fellow except that at the right upper pole, anteriorly, there is a necrotic area 5 cm. in diameter and 5 cm. deep. The cavity in the liver and that just described in the kidney constitute respectively the top and the bottom of a retroperitoneal abscess; while it probably communicated with the sinus mentioned above. This was not demonstrated owing to the fact that the abscess was not thought to exist and was only discovered on removing the kidney after all of the normal relations had been disturbed. The abscess had apparently started in the retroperitoneal tissues, gradually invading both the liver and kidney. Its situation marked so accurately the point of greatest tenderness that I am of the opinion that the infection occurred here early, but probably from the escape of pus through the sinus it failed to reach sufficient size to give the distinctive signs.

CASE III.—A woman, seventy-one years old. She had been conscious of a pain in the right lower abdomen for the past month and for the last two weeks had been unable to extend her right thigh; five days before admission she discovered a large mass in the region of the cæcum; for the last three days she had had chills followed by sweats.

Upon admission to the Jefferson Hospital, Aug. 26, 1911, the temperature was 101 3/5°, pulse 120, respiration 20; physical examination showed a large tender mass in the right iliac

sage of gas caused pain in the region of the sigmoid. There was also present an irritability of the bladder, and micturition caused pain in the lower abdomen. On January 7, the temperature was 100° F., pulse 108, leucocytes 13700, with 76 per cent. of polynuclear cells. The following day temperature was 103° F., pulse 120, leucocytes 21000, with 88 per cent. polynuclear cells. A high enema was given after he entered the hospital, without result.

*Physical Examination.*—The patient was a well-developed, muscular man, 6 feet 3 inches tall. Abdominal examination showed nothing but moderate rigidity, tenderness, and an indefinite resistance suggesting a mass in the left iliac region. With the finger in the rectum, however, this mass could be definitely made out bimanually, just above the prostate and to the left side, apparently adherent to the posterior bladder wall.

A radiograph was taken after a high enema of bismuth had been given. This showed a narrowing of the sigmoid flexure, but there was no complete obstruction anywhere in the colon.

From this data a probable diagnosis of diverticulitis of the sigmoid was made, and an immediate operation advised.

Operation confirmed the diagnosis. There was a marked thickening of the whole sigmoid flexure which, with the mesosigmoid, was adherent to the posterior bladder wall, thus accounting for the pain in the lower abdomen on micturition. In the mesosigmoid there was a thrombosis of the vessels, and an abscess had developed in the thickened mesosigmoid. Because of the thrombosis and damage to the mesosigmoid, a resection of the sigmoid and removal of the inflamed mesosigmoid was done, and an end-to-end anastomosis by suture was performed. A large rubber dam drain was inserted between the point of anastomosis and the posterior bladder wall. The reason for doing the end-to-end anastomosis, rather than performing the resection by the Mikulicz three-stage method, or the Bloodgood method of anastomosis, was due to the facts that the area resected was so low in the sigmoid, and the distal segment which had been adherent to the bladder wall so oedematous and swollen that the distal segment could not have been brought out of the wound, and these two methods of treatment were impossible. Also, immediate anastomosis was not contra-indicated, as there was no acute obstruction present, but perhaps an anastomosis by the

abscess to deal with, I determined to avoid, if possible, having the drain pass through either the pleura or the peritoneum.

The abdomen was explored through a left-rectus incision just below the costal margin revealing a mass above, and anterior to the spleen; this was walled off from the rest of the abdomen by gauze packs and a second incision made through the skin just below the ribs in the left flank; the peritoneum was exposed, then with a finger in the abdomen as a guide, the peritoneum was dissected from the diaphragm through the second incision until the abscess was broken into. The abdominal wound was then closed by an assistant who had remained clean for that purpose. The abscess was then explored and found to extend to the region of the cardia, and to penetrate the diaphragmatic muscle a little to the inner side of the left nipple line and well posterior, but did not communicate with the pleurā or the peritoneum. Drainage was established by means of rubber tubes and the patient's convalescence was uneventful.

*Treatment.*—The treatment of subdiaphragmatic abscesses consists primarily, in establishing drainage. If a mass presents in front it should be reached through an abdominal incision without opening the general abdominal cavity if possible, or if this danger cannot be eliminated, the peritoneum should be opened below the abscess and the general cavity protected by gauze before evacuating the abscess. If the abscess is situated in the subhepatic fossa or is retroperitoneal on either side, it can be reached through a loin incision alone, or in conjunction with an abdominal incision through which the lower limits of the abscess can be determined and the dissection which is conducted through the loin incision aided and guided to the abscess without opening into the peritoneum. This accomplished the abdominal wound can be closed by an assistant who has remained clean for the purpose.

If there is reason to fear that the peritoneum may be entered in the effort to reach the abscess the intraperitoneal site may be walled off from the general cavity of the peri-





diverticula of the small intestine nearly all occur in the mesenteric border, while in the colon they are frequently found in the lateral wall or opposite the mesentery in relation to the appendices epiploica.

Age, obesity, constipation, flatulence, general muscular debility, loss of weight, all may be factors in increasing the congenital or acquired weakness and lessening the resistance of the intestinal wall, or increasing the pressure within the intestine and thus causing the intestinal wall to protrude at its weakest point forming the diverticulum. Telling<sup>20</sup> calls attention to the importance of a history of straining at stool as a cause of perforation.

It is difficult to understand, however, why, if constipation is a very important etiological factor, diverticulitis should be more common in men than in women. Also, the patient in the case reported above was a well-developed, muscular man, presenting none of the etiological factors mentioned except flatulence.

*Pathology.*—Diverticula may be found anywhere in the intestine from the duodenum to the rectum. They are most frequent in the descending colon and sigmoid. While they occur in the rectum, they are rare in this portion of the bowel, due, probably, to its thicker muscular coat (Schreiber<sup>26</sup>). They may be single or multiple, as many as four hundred having been found in a single individual at autopsy. Careful search shows that they are comparatively frequent as, according to Mayo,<sup>9</sup> they may be found by careful search in one-third of the autopsies of middle-aged or older persons.

In the beginning they are small in size and are probably nearly all of the true type; that is, including all of the coats of the intestine. As they increase in size from pressure from within, the muscular coat becomes thinned out and becomes deficient, the circular layer giving way first, and there is often an atrophy of the mucosa with a hypertrophy of the submucosa. While they usually do not attain a large size, they may develop to the size of an egg.

of the last few years have done more to arouse an interest in this subject than anything else excepting the work of Elias Metchnikoff, who through his investigations upon the bacterial flora of the intestine has aided independently and deserves to share with Mr. Lane the credit of this awakened interest. Mr. Lane's proposal and the procedure which he for ten years has followed, namely, the removal of the entire colon in properly selected cases, where the sewerage functions of the large intestine are inadequate and unsatisfactory, has in a measure staggered the medical world through its seemingly heroic nature. We are inclined to suspect that in many instances the consideration of the subject ended with this initial surprise and a prompt condemnation of the proposal. The question hinges upon the correctness of the premises and not upon our impression as to whether or not we believe the procedure to be heroic.

Just about 100 years ago the medical world ridiculed and doubted the performance of McDowell in the removal of an ovarian tumor. An operation considered in the light of that period was far more heroic than the removal of the colon considered in the light of the present developed state of intestinal surgery.

Direct observations of Mr. Lane's work at Guy's Hospital, almost two years ago, gave me the impression, which in time grew to a conviction, that Lane's procedure was here to be reckoned with, and it only remained for time and experience to define its limits and perfect its details.

Its reception will doubtless be a stormy one. It will always remain an operation that deserves to be carefully considered and painstakingly performed.

Mr. Lane has been accused of being too radical. This is not at all unreasonable. The natural place of a leader is in advance of his followers, and in this movement Mr. Lane undoubtedly occupies the position of leader.

The technical difficulties that attend the operation are several.

toms, especially increase of pain on emptying the bladder when adhesions exist between this viscus and the sigmoid. These symptoms may subside or the pathological process may result in:

2. A chronic inflammation causing thickening in the intestinal wall or mesentery, which may form a palpable mass and be mistaken for a carcinoma, or adhesions to other loops of intestine resulting in signs of intestinal obstruction due to these adhesions, or to narrowing of the calibre of the intestine involved.

3. Acute inflammation, or perforation due to ulceration of the wall of the diverticulum, resulting in a general peritonitis or localized abscess with symptoms on the left side, similar to those caused by an acute inflammation of the appendix.

4. Perforation of a localized abscess into the bladder, or externally on the left side with the formation of a fecal fistula.

5. Development of carcinoma at the site of the diverticulitis.

In addition to the symptoms caused by the above-mentioned conditions, cases have been reported of perforation into a hernial sac, the formation of a loose body or fecal concretion free in the abdominal cavity, and the development of a metastatic abscess in the liver.

Differential diagnosis must be made from carcinoma, tuberculous peritonitis, constriction of the intestine due to other causes, and in the presence of perforation, from other causes of peritonitis. In the presence of a palpable mass, the absence of symptoms of ulceration and melena will aid in the differential diagnosis from carcinoma.

*Treatment.*—Probably no diagnosis of diverticulitis will be made until an inflammatory process begins in or about the diverticulum. In the presence of perforation the treatment is essentially surgical. If the diverticulum is single and the inflammatory area is localized, a local excision with closure of the opening left by the excision may be practised. If

end projecting beyond the anastomotic opening in the proximal limb. Otherwise the lateral anastomoses were made in the usual way.

In the end-to-side, two methods were tried. In the one, the proximal end was invaginated into the side of the distal limb through two mattress sutures after the method of Jesset, and the invagination made permanent and secure through a continuous Lembert suture applied separately to each half of the circumference of the invagination.

FIG. 1.

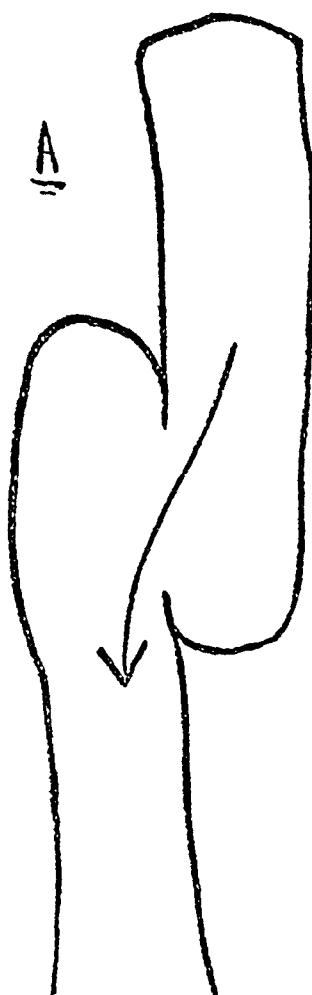


FIG. 2.

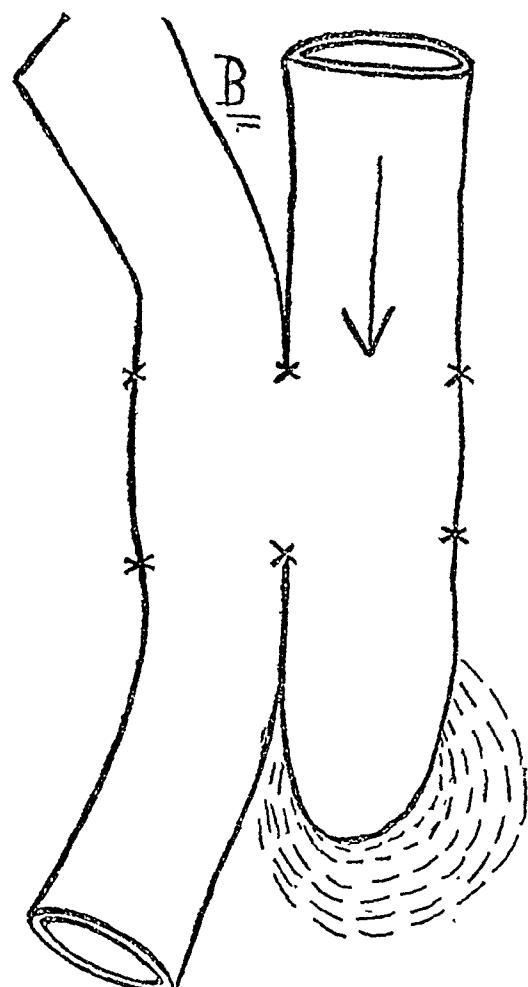


Fig. 1.—Showing tendency for the two sections to pull into a straight line in a lateral anastomosis when there is no excessive overlapping.

Fig. 2.—Showing tendency of the blind end of the proximal limb to become distended beyond the opening where an excess of overlapping exists.

NOTE. X, X, X, X, the dead areas of the intestine due to the division of the circular fibres.

The other end-to-side connection was performed according to the usual method of connecting the duodenum to the stomach or a lateral anastomosis, namely, an outside row of seromuscular sutures and an inside row of through-and-through sutures.

The experiment to which I wish to direct especial attention is the

- <sup>11</sup> Giffin and Wilson: Am. Jour. Med. Sciences, cxxxviii, 1909, p. 661.
- <sup>12</sup> Wilson: Jour. A. M. A., Iv, 1910, p. 921.
- <sup>13</sup> MacCarty: Jour. A. M. A., Iv, 1910, p. 488.
- <sup>14</sup> Wilson: ANN. SURG., liii, 1911, p. 223.
- <sup>15</sup> Rowlands: Lancet, April 30, 1910.
- <sup>16</sup> Taylor and Larkin: Lancet, February 19, 1910.
- <sup>17</sup> Cameron and Rippman: Guy's Hosp. Reports, xliv, 1910, p. 373.
- <sup>18</sup> Hartwell and Cecil: Am. Jour. Med. Sciences, August, 1910.
- <sup>19</sup> Bruce: ANN. SURG., liii, 1911, p. 682.
- <sup>20</sup> Telling: Proctologist, v, March, 1911.
- <sup>21</sup> Barbat: Surg. Gyn. and Obstr., x, 1910, p. 295.
- <sup>22</sup> Abbott: Jour. Minnesota State Med. Assn., xxx, 1910, p. 118.
- <sup>23</sup> Erdmann: Yale Med. Jour., xviii, February, 1912.
- <sup>24</sup> Powers: ANN. SURGERY, lvi, 1912, p. 118.
- <sup>25</sup> Ashurst: ANN. SURGERY, xlvii, 1908, p. 300.
- <sup>26</sup> Schreiber: Deut. arch. of klin. med., 1902, p. 122.
- <sup>27</sup> Cripps: Cancer of Rectum, 1907.

end-to-end methods are considered greater than those that attend the lateral anastomoses or an end-to-side as usually performed.

The end-to-end may in time be so perfected that its risks from infection will be no greater than those that attend the lateral effort. In the *Transactions of the Thirty-seventh German Surgical Congress*, Moschowitz describes a set of instruments for controlling or at least minimizing the risks of infection from the intestinal contents.

While the simple needle and thread should do the work, further improvements in the prevention of the escape of intestinal contents or the exposure of the intestinal mucosa are desirable.

With a given number of operators of varying experience, the immediate results of a lateral anastomosis would likely be in favor of the lateral method.

The particular advantages ascribed are that it is easier to secure the approximation of serous surfaces in this than in the end-to-end.

Furthermore, the difference in the sizes of the joining limbs present no obstacle. The chief disadvantages of the lateral method seem first that it is practically a triple operation.

The secure invagination of the ends where two ends are to be dealt with, is not always quite so simple nor as rapid as we sometimes would like.

Second, if the opening is a large one, we have a large dead area as the result of dividing a corresponding section of circular fibres, and if the opening is a small one, the danger of the opening becoming in time insufficient, is not altogether imaginary. The liquid character of the contents of the ileum reduces this danger to a minimum. The blind end beyond the anastomosis if it exists will in time undergo dilatation and may become a source of disturbance. If the anastomosis is made snug, *i.e.*, without any projecting blind ends, a favorable change occurs in the every increasing tendency of the two limbs pulling themselves in a straight line

veloped intestine, yet the abdomen and sac display anatomical and physical peculiarities quite different from one another, in so far as the reception and defence of pressure is concerned. The former is in part protected by a skeletal wall and in part by muscles fully capable of protecting the underlying intestine from ordinary pressure. The sac, which may be considered as a pyriform prolongation of the peritoneal cavity, consists of a neck or upper portion and a body. The former, generally speaking, is hemmed in by integument and a sparse muscular and aponeurotic covering and the pubic ramus. The body is enveloped on all sides by the elastic scrotal wall, and hence but poorly protected.

The methods by which pressure is applied varies. Crushing accidents, blows, horse kicks, falls, are responsible for the majority of concealed intra-abdominal intestinal injuries, while to these may be added, in the case of intrasaccal injuries, manual trauma, a product of the pernicious habit of the forcible reduction of herniae.

The direct cause of such injuries has been a fruitful source of discussion, and generally speaking one must bear in mind the difference in the resisting power of the various walls—of the skeletal and muscular walls of the abdomen—of the muscular and integumental coverings of the sac, and of the skeletal bridge which underlies it.

Depending upon its direction and application, abdominal pressure may either be broken on the skeleton, may force muscular wall to rigid skeleton, or may approximate muscular wall to muscular wall. In the former case it is extremely unlikely that, without external evidences of injury or fracture, harm could be done the intestines or mesentery to any great degree. What changes occur when muscular wall is forced against the vertebral column, or the sacral promontory, or other points of the bony framework? The abdominal cavity is directly encroached upon and the intra-abdominal pressure greatly increased, due to the marked diminution of the size of its cavity; while the intestines, in great part, are driven from the immediate region of the greatest extra-

According to Gerster and others, the bands and membranes are due to a colitis and pericolitis, the result, as Pilcher expresses it, of a long-continued, or oft-repeated mild infection of the peritoneal covering. It is, we believe, beginning to be realized that while the bands do support they also more or less interfere. It seems fair to assume that the arrest for an undue time of the bacterial-laden contents of the large bowel, especially where there is an abundance of moisture organisms and lymphatics, as in the cæcal region, that the continuance of such a condition for a long period will result in permanent changes.

The work of Metchnikoff plainly suggests the chemical side of the question, *i.e.*, the chemistry of the large intestine when its functions are for any length of time interfered with. Efforts are being made to solve the ill effects of the prolonged retention along these lines.

Systems of gymnastics are being worked out with the view of favorably influencing this condition, supplemented with bandages which add to the comfort and aid in maintaining a support of the blood pressure. The influence of an abnormally movable kidney as a factor in the development of splanchnoptosis has not received the attention it deserves. Few of us, perhaps, realize that the retroperitoneal position of the kidney when making excursions enables it to dissect loose through attrition the peritoneal attachment that served to anchor the viscera to the vertical column.

Gerster, whose opinions are deservedly worthy of careful consideration, expresses himself as follows:

"Prevention has a wide field of usefulness, especially here in America, where chronic colitis is almost endemic. A reasonable restriction of animal food will control putrefactive processes; a generous and daily use of fresh vegetable matter in the shape of well cooked and attractively seasoned dishes, will supply bulk and friction needed to induce normal and adequate peristalsis. The practice of what may be called 'physiological intestinal discipline' should be inculcated from

Similar principles may be applied under different conditions to the hernia sac and its contents. In its upper part, with its rigid background of pubic ramus and its thin unprotecting covering, conditions are ideal for a crushing injury, such as truss injuries, kicks, blows, etc. Unlike this the lower portion has no bony border, but is completely enveloped in thin elastic scrotal wall and yields readily to pressure; and the lack of support affords heightened susceptibility to explosive and crushing ruptures, to direct injuries, and to manipulative trauma, the latter so frequently associated in this location with bowel whose resistance has been lowered by constriction.

The fixation of the scrotum, the distention and amount of bowel in the sac, its condition and fixation, and the elasticity of the scrotum—all are important determining factors in such injuries and involve definite physical principles which make it possible to explain the outcome of the pressure.

The following cases which have been operated on by the writer for this condition are interesting in that they represent nearly all the different forms of concealed intestinal injuries with which one meets in the hernial sac.

CASE I.—S. M. W., aged 27. Right inguinal hernia "caught down" 24 hours before admission. *Forcible reduction applied.* Condition persistently became worse. Is restless, toxic, shocked. Pulse 120, temperature  $99.2^{\circ}$ , white blood-cells 35,000. Abdomen: Marked distention. C. M. obliterated. R. M. everywhere limited. No visible peristalsis. No masses seen. Distinct bulging in flanks. Slight general tenderness of entire abdomen, but walls fairly soft. Tympany everywhere except in right flank, where there is slight movable dulness. Liver dulness 4 cm. above C. M. In right inguinal region there is a bulging which reaches from internal ring into scrotum, forming an oval swelling about  $6 \times 4$  cm. Percussion note flat. Fairly soft. Skin movable over swelling. Slightly tender. Rectal examination: Marked bulging in anterior wall. Testes and epididymes normal.

*Operation (Dr. Remsen):* Under cocaine, skin and external oblique aponeurosis divided; the ilioinguinal and iliohypogastric

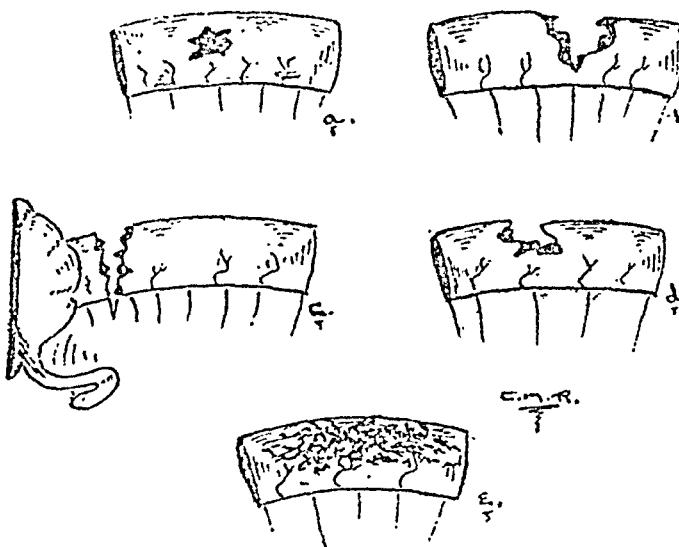
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distention. No masses nor visible peristalsis. General tenderness not localized. An extreme degree of abdominal rigidity existed. Submural palpation impossible. There is a small swelling in the inguinal region, tympanitic, very soft, compressible and tender and increased in size on coughing.

*Operation* (Dr. Remsen): Inguinal swelling explored first. A hernial sac filled with fecal matter and containing no bowel was exposed. Fecal material was seen escaping from abdominal cavity through inguinal canal into sac. Immediate abdominal exploration revealed a ruptured ileum (Fig. 2, a) and a peritoneal

FIG. 2.



Concealed intestinal injuries occurring in the hernial sacs (viz. text).

cavity soiled with intestinal contents. Suture of rupture and careful toilet of the peritoneal cavity and slight drainage completed the abdominal operation. Sac treated by drainage owing to soiling with the intestinal contents. Recovery with only slight recurrence of hernia.

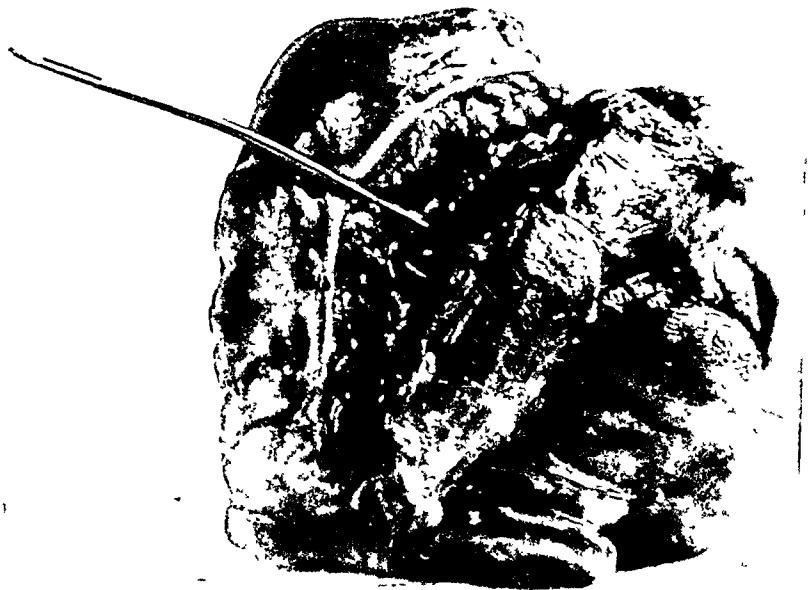
CASE III.—M. B., aged twenty-two. Hernia two years. "Caught down" 48 hours before admission, with nausea and vomiting. *Forced manipulative reduction* 36 hours ago with disappearance of the mass and cessation of vomiting but with increase in pain which now extended to abdomen. Pulse slow and soft. White blood-cells 22,000. Pupils small. (Patient has been given large amounts of morphia.) Face anxious. Patient thirsty. Abdomen markedly distended. Moderately tender over

hours. Nausea but no vomiting. Abdomen now shows slightly diminished respiratory movements on left side. General condition normal. There is slight tenderness in left iliac fossa, well localized and corresponding to the area of abdominal tenderness. Hernial sac negative. General condition excellent and the local signs so mild and showing improvement so markedly that operation was postponed. Local conditions improved and patient discharged in three days with no abnormal symptoms.

Suggestive, then, is the history of trauma applied to a hernial sac, followed by acute abdominal signs and symptoms; the tense rigidity of the abdominal walls, as emphasized by Moynihan, in concealed abdominal ruptures; and the soft, tender, fluctuant and bulging hernial sac, an evidence of the escape of intestinal contents into this latter cavity. When coupled with the shock and general symptoms and signs which one would expect with such an injury, there is formed a group almost positively indicating a concealed injury or rupture of bowel contained, at least at the time of the accident, in the sac which has suffered the trauma.

I wish to acknowledge my thanks to Dr. William S. Halsted for his kindness in allowing me to report the four cases of this series that occurred while I was in his service at the Johns Hopkins Hospital.

FIG. 1.



Diverticulitis of sigmoid. Intestine has been split open opposite mesenteric border. Probe passes through opening of diverticulum into abscess in greatly thickened mesosigmoid.

abdomen was opened through a generous mid-line incision, and the cervix removed by Wertheim's method. Considerable difficulty was experienced during the operation on account of the dense adhesions about the cervical stump, the bladder and ureters. The cervix, together with the growth and a wide margin of normal vaginal wall, was successfully removed, however, without injury to the ureters. Aside from slight suppuration at the lower angle of the incision, the patient made an uninterrupted recovery. Microscopic examination of the growth showed it to be squamous-cell carcinoma.

The second case, E. L., age thirty-eight, was first admitted to the hospital in January, 1900, complaining of an abdominal tumor. Examination showed the lower abdomen to be distended asymmetrically by a large cystic mass more prominent on the left side. At operation, Dr. Kelly found a large ovarian cyst on the left side and a somewhat smaller one on the right, both densely adherent to the uterus, bladder, omentum and intestines. After much difficulty, the adhesions were finally released sufficiently to allow the removal of both cysts together with the tubes and uterus, the latter being amputated at about the level of the internal os. The raw areas were then closed over as far as possible. The patient made a satisfactory recovery and was discharged well some three weeks later. She remained in excellent health until November, 1903, when she began to have a foul vaginal discharge. She was again admitted to the hospital, in July, 1904, having had two severe hemorrhages from the vagina, each of which had followed a vaginal examination by her physician at home. On admission, a fungating growth was found which occupied the entire cervix and the vagina for a short distance about it, and the entire anterior vaginal wall down to a point below the internal urethral orifice. In spite of the extensive vaginal involvement the growth seemed quite freely movable. At operation, Dr. Sampson found the pelvis filled with adherent loops of intestine and omentum. With much difficulty, these were freed and the cervix found, when it could be seen where the growth had extended upward. The ureters on each side were then freed and the cervix dissected loose laterally. Incision was then made into the bladder, the outer wall of which, together with the growth, was excised down to

Author*	Supravaginal Hysterectomy for	Type of Malignancy in Cervical Stump	Subsequent Development	Remarks
Botrong <sup>1</sup> ....	Myomata uteri.....	Carcinoma..	4 years.	
Chaput <sup>2</sup> ....	a Pelvic inflammation	Carcinoma..	1 year 3 mos.	Possibly coexisting.
	b Pelvic inflammation	Carcinoma..	1 year.....	
	c Pelvic inflammation	Carcinoma..	6 years.	
	d Pelvic inflammation	Carcinoma..	2 years 6 mos.	
Chrobak <sup>3</sup> ....	a Myomata uteri.....	Carcinoma..		
	b Myomata uteri.....	Carcinoma..		
	c Myomata uteri.....	Sarcoma....		
Carrier <sup>4</sup> ....	Myomata uteri.....	Carcinoma..	8 mos.....	Probably coexisting.
Fleischmann <sup>5</sup> .	Myomata uteri.....	Carcinoma..	7 years.	
Freund <sup>6</sup> ....	Menorrhagia.....	Carcinoma..	1 year 6 mos..	Probably coexisting.
Hargrave <sup>7</sup> ....	Myomata uteri.....	Carcinoma..	6 mos.....	Probably coexisting.
Jacobs <sup>8</sup> ....	a Myomata uteri.....	Carcinoma..	1 month.....	Almost surely coexisting.
	b Myomata uteri.....	Carcinoma..	1 month.....	Almost surely coexisting.
Kaufmann <sup>9</sup> ...	Myomata uteri.....	Carcinoma..	4 years.....	Found at autopsy.
Ladinsky <sup>10</sup> ....	Myomata uteri.....	Carcinoma..	6 mos.....	Probably coexisting.
Leonard....	a Pelvic inflammation	Carcinoma..	18 years.	
	b Bilateral ovarian cysts and pelvic inflammation.....			
Lewis <sup>11</sup> ....	Myomata uteri.....	Carcinoma..	3 years.	Probably coexisting.
Lumpe <sup>12</sup> ....	Pelvic inflammation	Carcinoma..	6 mos.....	
Manton <sup>13</sup> ....	Myomata uteri.....	Sarcoma....	1 year 8 mos.	
Menge <sup>14</sup> ....	Myomata uteri.....	Sarcoma....	3 mos.....	Probably coexisting.
				Sarcoma later found in original specimen.
Newman <sup>15</sup> ....	Myomata uteri.....	Carcinoma..	9 mos.....	
Noble <sup>16</sup> ....	Myomata uteri.....	Carcinoma..	7 years.	Probably coexisting.
Norris <sup>17</sup> ....	Myomata uteri.....	Carcinoma..	8 mos.....	
			2 years.	
Olshausen <sup>18</sup> ...	a Myomata uteri.....	Carcinoma..	7 years.	
	b ? .....	Carcinoma..	7 years.	
Quenu <sup>19</sup> ....	Myomata uteri.....	Carcinoma..	5 years.	
Richelot <sup>20</sup> ....	Myomata uteri.....	Carcinoma..	6 mos.....	Probably coexisting.
	Myomata uteri.....	Carcinoma..	?	
	Myomata uteri.....	Carcinoma..	3 years.	
Savor <sup>21</sup> ....	Myomata uteri.....	Carcinoma..	4 years.	
Schenk <sup>22</sup> ....	"Large, uterine tumor".....	Carcinoma..	5 mos.....	Probably coexisting.
Turner <sup>23</sup> ....	Myomata uteri.....	Carcinoma..	8 mos.....	Probably coexisting.
v. Ehrlach <sup>24</sup> ...	Myomata uteri.....	Carcinoma..	1 year.....	Probably coexisting.
Wehmei ....	Myomata uteri.....	Sarcoma....	8 mos.....	Probably coexisting.

\* Figures after authors refer to bibliography.

Fæces may be forced into the diverticulum resulting in the formation of a concretion. When this happens ulceration of the mucous layer may occur, or even without ulceration of the mucous layer or concretion formation, there occur inflammatory changes in the wall and surrounding tissues, resulting in a peridiverticulitis. This condition may continue to exist as a subacute or chronic condition, with a resulting thickening and inflammation of the intestinal wall, or perforation may occur with the development of a localized abscess, a general peritonitis or the formation of a fistula. Perforation into the bladder has occurred. Cripps<sup>27</sup> states that the majority of cases of fistula between the bladder and large intestine are inflammatory and not malignant. It has also been shown that carcinoma is apt to develop at the site of the diverticulum. Mayo found that carcinoma had developed in seven out of twenty-seven cases of diverticulitis of the large intestine.

*Symptoms.*—Diverticula of the intestine, in the absence of inflammatory changes in the walls of the diverticula or surrounding tissues, probably cause little or no symptoms. In the presence of inflammatory changes, the symptoms will vary with the pathological conditions present. Telling,<sup>20</sup> in his analysis of the histories of forty-seven cases, found the average age at which symptoms appeared was fifty-five years.

As it is in the large intestine, particularly the sigmoid, that diverticula are most frequent, and that in this portion of the intestine conditions are most favorable to the formation of fecal concretions, it is in the lower left quadrant of the abdomen that symptoms of diverticulitis usually manifest themselves. As Hartwell and Cecil have pointed out, these symptoms often resemble those of an appendicitis in the left side, varying with the pathological process in or about the diverticulum, similar to an analogous inflammation in the appendix. Thus we may have:

1. A mild subacute or chronic inflammation, undergoing remissions, causing pain and tenderness in the left lower quadrant at times, sometimes associated with bladder symp-

sequent malignant degeneration in the cervical stump are probably sacrificing several lives to save one. Furthermore, the development of carcinoma in the vaginal vault after pan-hysterectomy for non-malignant disease, is not unknown; Delbet<sup>36</sup> and Quenu<sup>10</sup> have each reported such an occurrence, the latter author having observed two examples. The comparative rarity of carcinoma of the cervix after supravaginal hysterectomy is probably correctly explained by Faure<sup>37</sup> who in over a thousand cases of subtotal hysterectomy has never observed malignancy in the cervical stump. He says, "I have often examined the cervix after supravaginal hysterectomy; it is almost always small, atrophied, and I am convinced, in a state of epithelial inactivity decidedly unfavorable to the development of cancer." Even among the comparatively few cases reported, a number must be thrown out on the grounds that cancer of the cervix existed at the time of the hysterectomy but escaped detection. Among the thirty-six cases in the table there are at least sixteen, in which it is very improbable that the development of the cancer was truly subsequent. If these cases be dropped, the list is practically cut in half, giving even a better appreciation of the infrequency of the condition.

In the great majority of cases of carcinoma developing in the cervical stump after supravaginal hysterectomy, the uterus had been removed for myomata. A glance at the table is sufficient to convince one of this fact. There are 36 cases in the table, in 26 of which, or 72 per cent., the uterus had been removed for myomata. If we consider only those cases in which the carcinoma which subsequently developed was, in all probability, non-existent at the time of operation, we find that in 63 per cent. the uterus had been removed for myomata. It would seem, then, that the question of "Stumpfkarzinom" resolves itself into a consideration of the etiological relationship of myomata to cancer and a consideration of the technic to be used in removing a uterus containing myomata and not the technic of hysterectomy in general. The cases in which malignancy has developed in the cervical stump after

there is considerable inflammatory thickening of the intestine, or a thrombosis of the mesentery, or an abscess in the mesenteric wall resulting in impaired circulation of the intestine, a resection should be performed. If a localized abscess is present, it is probably better to drain this, with subsequent repair of the fecal fistula, if such develops.

In case it is necessary to do a resection, in the presence of obstruction, where possible the three-stage operation of Mikulicz should be done, or the anastomosis after the method of Bloodgood. When no obstruction is present, and the area resected is high in the sigmoid, a lateral anastomosis should be most satisfactory; while if low down, the anastomosis by invagination of the upper into the lower segment should be the best method.

Although one of the less common abdominal pathological lesions, in making a diagnosis of an abnormal condition in the left lower quadrant of the abdomen, the possibility of the presence of a diverticulitis must be considered. Also, in searching for the cause of a local abdominal abscess or general peritonitis of obscure origin, particularly if no lesion of the appendix is present and the pus has the characteristic odor of the colon bacillus, a perforated diverticulum should be thought of as a possible etiological factor. It is also to be remembered that rough handling of the colon in the course of an abdominal operation for some condition other than diverticulitis, has resulted in the perforation of a diverticulum causing a general peritonitis with fatal result.

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exist alone, to their relative frequency when associated with myomata. Of 2513 cases of cancer of the uterus reported by Hofmeier, Krukenberg, Freundsen, Küstner, Winter and Cullen, 186 cases, or 7.4 per cent., were carcinoma of the body. On the other hand, of 215 cases of cancer of the uterus, in association with myomata, reported by Hofmeier, Martin, Geuer, Winter (Berlin), Winter (Königsberg), Noble and Cullen—134 cases or 62.3 per cent., were cancer of the body. This remarkable contrast of the relative frequency of carcinoma of the body of the uterus, alone and in association with myomata, can only be explained by the assumption that fibroids bear a definite etiological relationship to cancer of the body of the uterus.

The question now arises as to whether the cervix, in a measure, also shares the tendency to become cancerous in the presence of myomata. Is the absolute incidence of carcinoma of the cervix increased when associated with fibroids of the body of the uterus? The question is answered in the affirmative by Winter,<sup>38</sup> who reports 25 cases of cancer of the cervix occurring among 1270 cases of uterine fibroids; about *two per cent.* He says in this connection, "There can not be the slightest doubt that even in those regions where carcinoma is most abundant an absolute frequency of carcinoma of the cervix of two per cent. is not in the remotest degree attainable." Again, Richelot<sup>20</sup> has pointed out that the general hypertrophy of the endometrium accompanying myomata of the body of the uterus is shared by the cervical epithelium; so that if this tendency to carcinomatous degeneration be directly attributable to active epithelial proliferation on the part of the uterine mucosa, there is sufficient ground for the assumption that the incidence of carcinoma of the cervix would likewise be increased. The fact that nearly three-fourths of the cases of carcinoma of the cervix, following supravaginal hysterectomy, thus far reported, have occurred after removal of the uterus for myomata, is strong presumptive evidence of some definite etiological association of the two conditions.

## THE HERNIAL SAC IN ITS RELATION TO CONCEALED INTESTINAL INJURIES.

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CONCEALED or subcutaneous injuries of the intestine, exhibiting lesions of more or less severity yet unassociated with a visible destruction of the intervening structures, while not frequent, nevertheless are far from unknown. Barring the minority of such accidents, based upon the dislodgement of and injury to the mesentery and its blood-vessels, leading to secondary dissolution of the intestinal wall, the greater portion of such cases is due to the sudden application of excessive pressure to the muscular walls of the abdomen, which in turn transmit this force to the underlying structures and thence to the opposite wall.

However, we are occasionally confronted with the picture of concealed intestinal injuries, where pressure, in lieu of being applied to the abdominal walls, has been exerted upon the tissues overlying an inguinal hernia.

There are factors, both as regards the relation of intestine to abdominal walls and to hernial sac and as regards the intestinal condition *per se*, which have a definite bearing, not only on the final outcome of the applied pressure, but also upon the methods by which this force may be applied.

Weakening of the intestinal walls, not only by disease but also by circulatory interference due to mesenteric trauma, is especially important in determining rupture, while intestinal distention, with which we are more frequently confronted, is a factor no less important. Probably the abnormal intestinal conditions are of greater frequency in injuries of herniated bowel, owing to the greater possibilities for interference with the vessels supplying intestine so located.

To a certain extent similar in their relation to the en-

out the cervix, dissecting out its mucous canal deep down toward, or into, the vagina. This step in the technic, involving a thorough enucleation, has recently been elevated to the dignity of a method by the distinguished London surgeon, Bland Sutton." The technic is simple, and adds but a moment to the operating time, which is largely compensated by the ease with which the cervix may be afterwards closed over. Should this procedure be employed as a routine in performing supravaginal hysterectomy for fibroids, the advantages would seem to be considerable: (1) The cervix could be more easily closed over. (2) A carcinomatous focus deep in the cervix, which would be otherwise overlooked, would be brought to light as in Landau's case. (3) By the removal of a large amount of the glandular portion of the cervix, the chances of subsequent carcinomatous degeneration would be proportionately diminished. It seems almost superfluous to add that, before the abdomen is opened, the cervix should be examined under sight and before closing, the amputated uterus should be laid open and carefully examined for evidences of carcinoma. Bearing in mind that three per cent. of all fibroids of the uterus are associated with cancer, a strict observance of these precautions would seem not only justifiable but of considerable importance.

To Dr. Howard A. Kelly, I wish to extend my thanks for suggesting the subject of this paper and for permission to report the two cases noted, which occurred in his clinic at the Johns Hopkins Hospital.

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abdominal pressure into areas free from this force, where they are temporarily fixed. The extra-intestinal pressure is focussed upon those sections "caught" between the opposing walls. The intra-intestinal pressure is greatly increased, not only in those imprisoned sections but also in the sections immediately adjoining these, as the gas and fluid are rapidly displaced from the former into the latter.

The action of the diaphragm in relieving intra-abdominal pressure as it is driven upward is neutralized, to all intents and purposes, by the reflex contraction of the other muscular boundaries of the abdomen. While the increased abdominal pressure is hardly in itself responsible for direct intestinal injury yet, by fixing the intestines, it is probable that the latter are more susceptible to synchronous blows with different points of application, and also to the injuries sometimes ascribed to muscular action alone, and to the possibility of the extrusion of a part of the tense wall, distended with gas and fluid, through the neck of a hernial sac.

The local increase in extra-intestinal pressure focussed upon bowel imprisoned between opposing walls is no doubt the greatest single factor in concealed intestinal injuries. The bowel wall, delicate as compared with the parietes, is ground, bruised, torn, and crushed against the bony skeleton, while the abdominal wall shows little or no evidences of the pressure.

Finally, the increased intra-intestinal pressure, due to the expressing of gas and fluid rapidly from one section of bowel to another, is occasionally the cause of an "explosive" rupture, when the increase in intra-intestinal pressure overcomes the resistance of the intestinal wall.

When muscular wall is forced against muscular wall there is no doubt but that the intra-abdominal conditions are altered very much, but there is great doubt whether only a rare case will show rupture or injured intestines under these conditions, so greatly is the shock ameliorated by the elasticity of the opposing muscular wall which acts as a buffer to the blow.

## SACROCOCCYGEAL TUMORS.

WITH A REPORT OF A LARGE TERATOMA.

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THE tumors of the sacrococcygeal region provide the most interesting and complicated collection of developmental errors of any region of the human body, so that before recording the details of a case which came under my care early this year it will perhaps help to make clearer its pathogenesis if the account is prefaced by a few words regarding the development of the caudal end of the embryo. Apart from neoplasms, such as lipomata, angiosarcomata, and lymphangiomata, which have no characters peculiar to this region, and leaving aside spinal defects, anterior and posterior spina bifida, spina bifida occulta, and the congenital dorsisacral herniæ, the congenital tumors of the sacrococcygeal region may be classified best into four chief groups: (1) caudal appendages; (2) dermoid cysts; (3) mixed tumors; (4) fetal inclusions.

1. *Caudal Appendages*.—These are of two types: true tails and pseudotails. The former consist of new growth of cartilage and bone or are definite prolongations of the sacrum.<sup>1</sup> The false tails are due to persistence of the caudal filament, or may be caused by the presence of a tail-shaped lipoma. False tails contain no bone.

2. *Dermoid Cysts*.—These may exist as sinuses or as simple dermoid cysts, and frequently contain collections of hair. They are found in the middle line of the body at the lower end of the sacrum and coccyx between the buttocks. Irritation and inflammation in adult life may be the cause of their being noticed at that time, although they have been present since birth. Their presence has been accounted for by various theories: incomplete closure of the medullary

To show ventral aspect, relation of anus etc.



FIG 1

lower portion. Respiratory movements diminished. No elevation of liver dulness. No shifting dulness. Large patent external (right) abdominal ring. No bowel in sac. Bowels moved once since onset. Owing to the masking of symptoms by morphia it seemed advisable to explore immediately.

*Operation:* Abdominal section revealed a section of bowel about 50 cm. in length limited by two indented circumferential impressions due to the pressure of the ring. In one portion of this section of bowel there was a definite bruising and reddening not at all resembling the bowel seen in a strangulated hernia (Fig. 2, e). This was viable, and active peristalsis occurred after artificial stimulus. The abdomen was closed and radical cure of the hernia followed. Recovery.

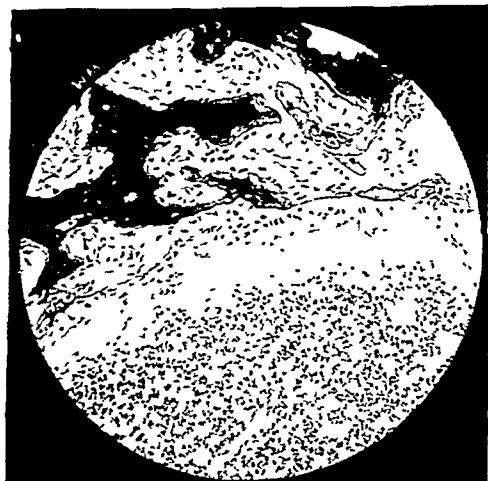
CASE IV.—I. M., aged forty-nine. Fall from scaffold four hours previous, *striking his abdomen (left inguinal region) across projecting board.* At present lies on back moaning with pain, thighs flexed, cautious respiratory movements. Markedly shocked. Very large left inguinal hernia exists. Palpation reveals intense abdominal rigidity. Submural palpation impossible. Abdominal tenderness general. Hernial sac very tender, and even gentle manipulative measures cause great pain. Liver dulness at six R. No shifting dulness. Increased abdominal tenderness in L. I. F. Slight general distention of abdomen. Marked shock. Blood-pressure 65.

*Operation:* Left rectus incision. On opening peritoneal cavity there was an escape of gas and bloody fluid. Search revealed a ruptured ileum (Fig. 2, b) in close proximity to the internal ring (left) and some intestinal contents extruding from sac into abdominal cavity through the ring. Very small amount of intestinal contents seen in the abdominal cavity itself. From these findings it seemed that the rupture had occurred in the sac itself rather than in bowel that was in the abdominal cavity at the time of the accident. Resection and lateral anastomosis. Patient never rallied. Death in two hours.

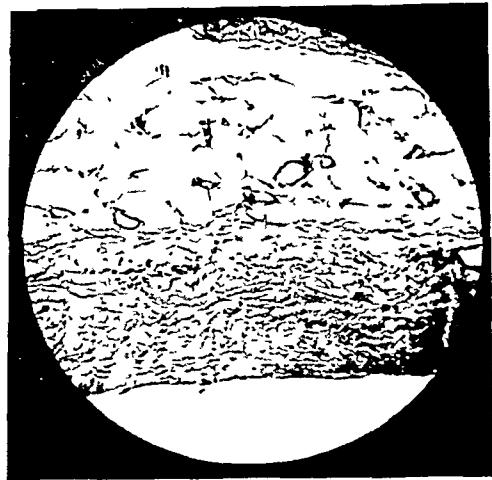
CASE V.—C. M., aged twenty-seven. Left inguinal hernia "caught down" several years ago and reduced successfully. Has been wearing truss for some time. Thirty-six hours ago *patient fell and compressed truss against pubic ramus, the hernia having been extruded during the fall.* Following this patient had severe abdominal pain, which, however, has diminished in the last 12



Sacrococcygeal tumor (deep aspect).



The cyst wall (fibrous) with adipose tissue ( $\times 175$  diameter).



# ON THE DEVELOPMENT OF MALIGNANT DISEASE OF THE CERVICAL STUMP AFTER SUPRAVAGINAL HYSTERECTOMY.

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A PATIENT who, eighteen years ago, had had a supravaginal hysterectomy for an advanced pelvic inflammatory disease, recently presented herself a second time for treatment at the clinic. Examination revealed a moderately advanced carcinoma of the cervical stump. On looking over the records of the clinic, one other similar case was found. At Dr. Kelly's suggestion, I have prepared a brief report of these two cases with a review of the literature on the subject.

M. Q., a negress, aged forty-three, entered the hospital for the first time in December, 1894, suffering with a severe pelvic inflammatory disease. At operation, the omentum and sigmoid were found densely adherent to a tubo-ovarian abscess on the left side. The adhesions were released and uterus removed by supravaginal amputation together with the adnexa on each side. The patient made a rapid and uneventful convalescence. About six weeks ago, some eighteen years after her operation, she returned complaining of profuse vaginal bleeding. This had begun one month previously with a sharp hemorrhage which lasted four days. Two weeks later, the bleeding reappeared and had continued up to the time of admission to the hospital. At operation, Dr. T. S. Cullen had the patient first placed in the lithotomy position, when the cervix was carefully examined. The posterior lip of the cervix was found to be the seat of a roughened, friable growth which bled very readily on manipulation and which apparently had not extended beyond the cervical stump. There being no doubt of its malignant nature, the

of serous fluid were allowed to escape. After this had been done it became apparent that the cystic part of the tumor was multi-locular and a second smaller cyst was tapped.

The solid element could now be examined more carefully; it was found to be about one and a half inches long and one inch across. Per rectum it could be felt running down behind the rectal wall commencing at the coccyx which felt much thickened. The fluid collected from the cysts proved to be simply serous and not cerebrospinal.

The diagnosis of sacrococcygeal tumor was made, and it was decided that removal should be attempted. As the operation was obviously to be of a serious nature it was postponed for a few weeks till the child should be in better physical condition. In the interval the skiagram (Fig. 2) was taken.

*Operation.*—To diminish shock the child was enveloped in a cotton wool suit which left exposed merely the head and the field of operation. Ether anaesthesia. Very little hemorrhage occurred. The growth was separated with little difficulty except where the rectum was in close apposition, and while dissecting in this situation a soft bougie in the rectum was of considerable assistance. The tumor (Fig. 3) after removal proved to be about six inches in length, four and a half inches across, and about the same depth. On the deep attached surface the coccyx ran directly into the solid growth and it was necessary to remove it with the growth.

The child made a surprisingly good and complete recovery; some little ingenuity and very frequent attention were required to ensure clean healing of the extensive and awkwardly situated wound.

The most successful treatment is undoubtedly radical excision as early as possible, so as to diminish the risk of thinning of the cyst wall and subsequent infection.

Palliative means, such as tapping, injection of irritants, etc., have frequently resulted in septic infection and death.

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the internal urethral orifice. The entire growth was apparently removed with a large margin. On the seventh day the patient became very restless and a condition of anuria set in. After infusions of saline, the patient improved and towards evening, the temperature, which had risen to  $104^{\circ}$ , fell to normal. Her condition then improved steadily until the twelfth day when there again appeared high fever, nausea, vomiting and anuria. On the following day, the condition had improved slightly but on the fourteenth day there was again complete renal suppression with pain in the region of the left kidney. Under nitrous oxide anaesthesia, Dr. Sampson exposed the left kidney and a number of small abscesses were found scattered over the cortex. These were incised with the Paquelin cautery after stripping back the capsule. On the fifteenth day, the patient's condition was unimproved and on the sixteenth day she died. Microscopic examination of the growth removed at operation showed it to be a squamous-cell carcinoma.

Chrobak<sup>1</sup> was probably the first to call attention to the possibility of the development of a malignant growth in the cervical stump after supravaginal hysterectomy. He reported three such cases, in two of which carcinoma was found and in the other, sarcoma. A number of similar cases have since appeared in the literature from time to time, Botzong,<sup>2</sup> in 1902, being able to collect quite a large list. So many cases have been reported since the appearance of Botzong's monograph that it seems worth while to review again the entire literature, particularly as the number of cases now at hand is large enough to justify conclusions as to their real clinical significance.

In the following table, there is reviewed a list of all the cases which have been more or less completely reported up to the present, while following it, is a list of the cases which have been occasionally mentioned in the literature, but never completely reported.

Further examination elicited the following facts:

1.12.10. X-ray examination of the bladder and kidney areas showed an absence of stone shadows. Urine clear to the naked eye, 38 ounces in 24 hours. Reaction acid, specific gravity 1021, no albumin, urea 2.5 per cent. Hæmorenal index (electrical resistance of urine and serum) 1.5 (normal 2).

2.12.10. Cystoscopy. The bladder was filled with 8 ounces of oxycyanate of mercury solution 1/4000. Both ureters appeared healthy. The bladder wall for the greater part appeared pale and healthy, but scattered irregularly over fundus and trigone were seen patches of submucous hemorrhages varying in size from a pin's head to a sixpence. The patches were of all shapes and sizes, some linear, some stellate. The greater number were scattered over the fundus. There was no ulceration and no sign of miliary tubercles. I came to the conclusion that I was either dealing with a purpuric condition of the bladder wall or that I had caught a primary blood infection of tuberculosis at its very onset.

On December 5th and again on the 6th a 24-hour specimen of urine was examined for tubercle bacilli and for pus cells. None were found. A "Von Pirquet" tuberculin reaction was done and was positive.

The urine remained clear till December 9, when another attack of pain and bleeding came on exactly similar to the first one. This lasted two days and then cleared up completely. Throughout the whole time the patient was in the hospital the temperature remained normal, and there were no signs of constitutional disturbance except that the patient felt below par.

15.12.10. No pain, no increased frequency, no blood for 4 days. Cystoscopy. The picture has changed completely. The bladder is quite healthy again save for three faint patches like fading bruises on the walls of the fundus. There is also a small fading patch of hemorrhage about one inch above the middle wall of the bar of Mercier into which a small blood vessel is seen to run and be lost.

16.12.10 Blood examination. Coagulation time 5 minutes. Red blood corpuscles 5,000,000. Hæmoglobin 85 per cent. Color index 0.8. White cells in normal proportions. Calcium lactate (10 grains three times a day) was administered for a week and the patient left the hospital on Dec. 19, apparently completely

rhages simulating or leading to intussusception. There is therefore sufficient clinical evidence to prove that an agent capable of producing a purpuric eruption can be circulating in the blood and can be thrown out into any single one of various situations, such as the intestine or bladder, without being thrown out into the skin at all.

The case is also of interest from the pathological standpoint. So long as the attempt was made to class purpuras on purely clinical grounds as separate entities so long the subject was in a state of confusion. A purpuric eruption, whether of skin or mucous membrane, must be considered as a symptom not as a disease. Such an eruption must be due to solutions of continuity in the walls of capillary blood-vessels with a result that blood escapes into the tissues.

When we inquire how this solution of continuity can arise we are not always able to detect a cause. When we cannot, we speak of primary purpuras, when we can we speak of secondary purpuras. We will discuss the secondary purpuras first.

The simplest cause is the mechanical weight of the blood which gives rise to that common form of purpuric eruption seen in those who rise from bed after a long illness. Again in patients who suffer from excessive blood-pressure such an eruption is sometimes seen. Certain chemical poisons are known to be able to cause such an eruption, as for instance chloral, iodoform, arsenic, quinine, the balsams, salicylates, potassium chlorate, mercury, phosphorus and lead; and the eruption of scurvy is probably due to a chemical alteration of the blood brought about by deficient ingestion of vegetable salts.

Again certain chemical poisons can arise within the body and give rise to purpuric eruptions such as have been described in nephritis, cirrhosis of the liver, in the cachexias, in pregnancy and in diseases of the blood.

But the most interesting group of all is that of the purpuras set up by the actions of micro-organisms or their poisons on the walls of the capillaries. Micro-organisms have been

body eliminate bacteria and other poisons? The main channels are undoubtedly the kidney, the skin, the bowel, the liver and to a less extent the lungs. Originally the coelom was the space into which poisons were excreted and were got rid of by means of the primitive nephridia.

The coelom is nothing but a large connective space. Any large connective tissue space can apparently be made use of by Nature into which to pour out substances harmful to the body. In such spaces these bodies can be localized, diluted, neutralized and finally, when neutralized, be absorbed back into the blood as harmless substances. Such spaces are the joints, bursæ, serous spaces and aponeuroses and these may be looked upon as the "dustbins" of the body and by being used as such a second purpose is attained. Inflammation of such spaces may cause such pain that locomotion is impossible and recumbency is thus forced upon the victim of a severe infection.

Absolute recumbency is of the utmost importance in recovery from such an infection, as by that means it is possible to diminish the amount of poisons absorbed from the local focus, whereby the defensive mechanism of the tissues is not overwhelmed but is stimulated to produce sufficient antibodies to overcome the invading host.

In the same way it is tempting to think that the bladder may still retain traces of its origin. The bladder is developed from the allantois which was once part of the excretory organ of the foetus.

It is permissible to suppose that in certain persons the bladder has not entirely lost its excretory function, and hence a bacterial poison circulating in the blood might be thrown out into the mucous membrane of the bladder and nowhere else. Anyhow such an hypothesis is a very tempting one.

If the hypothesis of a purpura secondary to a tonsillitis be rejected this case must be classed under one of the primary purpuras. Bérard and Roubier give three primary purpuras, namely *purpura rheumatica*, *infective purpura* and *Wehrlof's purpura*.

*Purpura rheumatica* is ushered in by prodromal symptoms,

In a number of cases operated on for uterine fibroids an early carcinoma of the cervix has been discovered more or less by accident. Landau<sup>40</sup> and Küstner,<sup>41</sup> according to Winter, have each had such an experience. Landau, while doing an abdominal myomectomy, discovered a small carcinomatous plaque in the depths of the cervix. Küstner found an early carcinoma of the cervix at autopsy in a woman who had died after a supravaginal hysterectomy for fibroids. Dr. Cullen<sup>39</sup> reports a case of great interest in this connection: Vaginal hysterectomy was performed, an interstitial myoma  $3 \times 3 \times 2$  cm. being found in the uterus. In the course of the routine laboratory examination of this specimen, there was found the earliest squamous-cell carcinoma of the cervix he had ever seen. In speaking of this case, Dr. Cullen says: "Had an abdominal supravaginal hysterectomy been done instead of total vaginal hysterectomy, we would ere long have had a well marked carcinoma of the cervix, and would have classed it as a carcinoma developing in the cervix after removal of the myomatous uterus, whereas the growth though clearly present at the time of operation, would have been overlooked." There can be no doubt, that in many, perhaps in half, of the cases listed in the table above, the carcinoma, though reported as having developed subsequently, was in reality present at the time of operation.

It is to such cases as those reported by Landau, Küstner and Cullen that attention should be drawn, as they clearly indicate the necessity for great watchfulness on the part of the operator, when dealing with uterine fibroids. Landau's case is particularly instructive as it would seem to suggest a procedure which if carried out as a routine in performing supravaginal hysterectomy for fibroids, would occasionally reward the operator by the discovery of an unsuspected carcinoma of the cervix. For a number of years Dr. Kelly<sup>42</sup> has made a practice of "cupping out" the cervix after supravaginal amputation of the uterus so that a better closure of its sectioned surface may be effected. Of this procedure, he says: "It is occasionally of considerable advantage to cup

# TRANSACTIONS OF THE NEW YORK SURGICAL SOCIETY.

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*Stated Meeting, held at the New York Academy of Medicine,  
March 12, 1913.*

President, DR. CHARLES L. GIBSON, in the Chair.

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## CHRONIC MASTITIS WITH CARCINOMA.

DR. PARKER SYMS presented a woman, thirty-nine years of age, who gave the following history. About eight years ago, after the birth of her only child, she had "caking" of the right breast. There was no abscess. After this there remained a permanent localized swelling of the gland.

On December 31, 1912, she was admitted to Lebanon Hospital on account of this swelling and on account of the fact that there had been some recent increase in its size and some slight pain in the breast. When Doctor Syms examined her he found a typical condition of chronic mastitis or abnormal involution of the right breast with a distinct tumor in its upper outer quadrant.

Believing that such a condition is a precancerous state or at least is potential of cancer, and believing that it is impossible to make any differential diagnosis in these cases, Doctor Syms did the radical ablation of the breast, pectoral muscles and lymphatics after the method of Willy Meyer, on January 15, 1913.

The specimen was submitted to a competent pathologist who made sections of the same and reported the condition to be one of simple adenofibroma with no evidence of cancer. Some weeks afterward, at Doctor Syms request the same pathologist made many sections of the specimen and finally he ran across one from which he made the diagnosis of cancer.

Doctor Syms said that he presented this case as one of particular interest and of great value because it emphasizes certain important points.

- <sup>10</sup> Ladinski: Amer. Jour. Obstet., 1911, vol. Ixiv, p. 316.  
<sup>11</sup> Lewis: Surg., Gyn. and Obst., vol. xvi, p. 104.  
<sup>12</sup> Lumpe: Centralb. f. Gynäk., 1905, vol. xxix, p. 1354 and p. 1598.  
<sup>13</sup> Manton: Surg., Gyn. and Obst., 1906, vol. iii, p. 169.  
<sup>14</sup> Menge: Centralb. f. Gynäk., 1895, p. 453.  
<sup>15</sup> Newman: Surg., Gyn. and Obst., 1906, vol. iii, p. 169.  
<sup>16</sup> Noble: Amer. Jour. Obstet., 1901, p. 503.  
<sup>17</sup> Norris: Amer. Gyn. and Obst. Jour., Nov., 1898, p. 495.  
<sup>18</sup> Olshausen: VIII Congr. d. Deutsch. Ges. f. Gynäk., 1899. Veit's Handb. der Gynäk. vol. i, p. 738.  
<sup>19</sup> Quenu: Bull. et mem. de la Soc. de Chir. de Par., 1905, p. 602 and 1910, p. 614.  
<sup>20</sup> Richelot: Bull. de l'acad. de Méd. de Par., 1903, p. 222.  
<sup>21</sup> Savor: Centralb. f. Gynäk., 1898, p. 1367.  
<sup>22</sup> Schenk: Arch. f. Gynäk., vol. Ixii, Table A, 18.  
<sup>23</sup> Turner: Brit. Med. Jour., 1905, vol. ii, p. 953.  
<sup>24</sup> von Ehrlach: Centralb. f. Gynäk., 1898, p. 1368.  
<sup>25</sup> Wehmer: Zeitschr. f. Geb. u. Gynäk., vol. xiv, p. 110.  
<sup>26</sup> Hartman: Bull. et mem. de la Soc. de Chir. de Par., 1897.  
<sup>27</sup> Murtry: Quoted by Richelot.<sup>20</sup>  
<sup>28</sup> LeDentu: Quoted by Richelot.<sup>20</sup>  
<sup>29</sup> Péan: Quoted by Richelot.<sup>20</sup>  
<sup>30</sup> Chr. Martin: Centralb. f. Gynäk., 1902, p. 103.  
<sup>31</sup> von Hacker: Quoted by Savor.<sup>21</sup>  
<sup>32</sup> Pawlik: Quoted by Olshausen.<sup>18</sup>  
<sup>33</sup> Batigne: La Gynéc., 1903, p. 522.  
<sup>34</sup> Condamin: Soc. de Chir. de Lyon, 1900, p. 40.  
<sup>35</sup> Krusen and Hammond: Brit. Gyn. Journal (?), 1905, p. 66.  
<sup>36</sup> Delbet: Bull. et mem. de la Soc. de Chir. de Par., 1910, p. 613.  
<sup>37</sup> Faure: Bull. et mem. de la Soc. de Chir. de Par., 1910, p. 612.  
<sup>38</sup> Winter: Zeitschr. f. Geb. u. Gynäk., 1906, vol. lvii, p. 8.  
<sup>39</sup> Cullen: Myomata of the Uterus, 1909, W. B. Saunders, Phila., and Cancer of the Uterus, 1909, W. B. Saunders, Phila.  
<sup>40</sup> Landau: Berl. klin. Wochenschr., 1899, p. 1039.  
<sup>41</sup> Kustner: Quoted by Winter.<sup>38</sup>  
<sup>42</sup> Kelly: Operative Gynecology, 1906, vol. ii, p. 265.

other organs aside from the right breast, which was the seat of a subacute, inflammatory process involving the whole inner quadrant, the mass thus formed measuring about 10 x 15 cm. in extent. The overlying skin was reddened, and at one point near the nipple it was on the verge of ulcerating. On palpation, the mass was irregular in outline; it involved the breast tissue in its entire thickness, and was adherent to the skin but not to the muscle. In consistency it varied from a very hard, inflammatory character to a fluctuation at the point where the skin was most reddened. There were areas of boggy swelling scattered through it, which were quite tender in some parts; in others, non-sensitive. There was one moderately enlarged gland, slightly tender, in the axilla.

The patient objected seriously to a complete removal of the breast, and accordingly, only the diseased area was removed. Primary union followed. The enlarged gland in the axilla was not excised, and a month after the operation it was no longer palpable.

Upon gross examination it was found that the excised portion of the breast was the seat of a chronic inflammatory process, with several small, suppurating foci. There were no evidences of cheesy necrosis: in parts, the exudate was of an almost stony hardness, but in many it was quite soft. The area immediately beneath the most inflamed point in the skin was broken down into an abscess, with moderately thick pus and ragged, necrotic walls. The clinical history of the case and the gross appearance of the specimen suggested tuberculosis, but a positive diagnosis was not possible. Microscopic examination, however, showed typical miliary tubercles, with giant cells and central necrosis. Section stained for tubercle bacilli demonstrated the organism.

#### BILATERAL CYSTIC DEGENERATION OF THE BREASTS.

DR. W. S. SCHLEY presented a woman, single, fifty-two years old, who was admitted to the hospital on February 16, 1908, complaining of trouble with her breasts. Examination showed that the breasts were rather small and flattened, firm, non-tender, and both contained numerous small and large nodules. A number of the larger ones were punctured and a clear fluid was withdrawn.

While the process was recognized as essentially a benign one, the possibility of overlooking a cancerous cyst was con-

my case. The surface of the tumor is smooth and regular over the larger cysts in contrast to the more nodular surface over the smaller cysts and solid portion. The swelling is soft, fluctuant, and translucent.

#### REPORT OF CASE.

A female infant, four days old, was sent to me, at the Manchester Northern Hospital, by Dr. Kyle, of Oldham. It was the fifth child of the family; the parents did not know of a deformity of any sort among their relatives, immediate or remote. Apropos of the bigerminal theory in relation to this class of tumors, it was ascertained that the only history of plural birth in the family was the case of the infant's paternal grandmother, who was herself a twin. Previous to the child's birth the mother said she could feel, on careful abdominal palpation, what she took to be two fetal heads, and when the child was born a swelling almost as big as its head was found in the perineal region.

It was said to have undergone no change during the four days which elapsed before I saw it, and the tumor, which was then roughly the size of the child's head, was, as the photograph (Fig. 1) shows, projecting from the sacrococcygeal region and apparently separating the glutei muscles of the two sides and chiefly projecting to the left. The tumor also extended forward to the perineum so that the anus was displaced downward and came to open directly forward.

The most prominent and dependent part of the swelling was covered by tense, shiny skin, which obviously enclosed a large collection of fluid. The upper part of the growth close to the coccyx was much firmer in consistency, and felt as though the coccyx, much enlarged, were continued down into the tumor. The general condition of the child was fairly good—on admission there was some diarrhoea (it had been bottle-fed) and the motions were so irritating as to have caused a good deal of soreness round the anus. There was no paralysis nor malformation of the legs. Micturition and defecation were not interfered with. It was found also that pressure over the cyst had no effect on the prominence of the anterior fontanelle. After sterilizing the skin the needle of a large exploring syringe was inserted at the most prominent point of the cyst, and several ounces

breast was wise. We had come to a more careful gross differentiation of breast tumors, with or without the aid of frozen sections, which had led to a somewhat more conservative surgery. We should not place too much reliance on the frozen sections, even if they were nearly perfect, as the excised portion may not have come from the particular part where the epithelial changes existed. Over-conservatism might be even more undesirable than radicalism, and a combined surgical and pathological experience in gross as well as microscopic anatomy was necessary in the conservative handling of breast growths. In doubtful cases the removal of the breast was certainly advisable, as none could gainsay the ultimate safety thus assured. After partial excision, cysts and adenomata sometimes developed in the remainder of the gland. Bloodgood, in 1909, declared that he had never seen cancer develop in any of the breasts treated by local excision at the Baltimore clinic.

#### EPITHELIAL CHANGES IN CHRONIC MASTITIS, AND THEIR RELATION TO THE DEVELOPMENT OF MAMMARY CARCINOMA.

DR. BURTON J. LEE read a paper with the above title.

DR. HARTWELL said the paper of Dr. Lee was most timely in more than one respect, as it definitely called our attention to a condition which actually existed, and to the changes which took place in the transformation of benign into malignant lesions. Every pathologist was aware of this fact and the frequency with which it was overlooked in surgical work. Dr. Hartwell said he had recently reviewed the subject of cancer for a paper which he was writing, and he had found an appalling number of cases which were seen by clinicians or surgeons, who had temporized with them in spite of the fact that they were already malignant or soon afterward became so.

In dealing with a chronic mastitis, the possibility of a malignant change was especially important. In the case of Dr. Hartwell's, reported by Dr. Lee, the breast was evidently the seat of a chronic mastitis, but there was one area, not localized, but quite hard and very suspicious of carcinoma. He did a radical operation, and Dr. Ewing examined many sections without being able to prove that it was carcinoma. He reported that it was a

Lateral skullogram. Tumor outline dotted.



FIG. 2

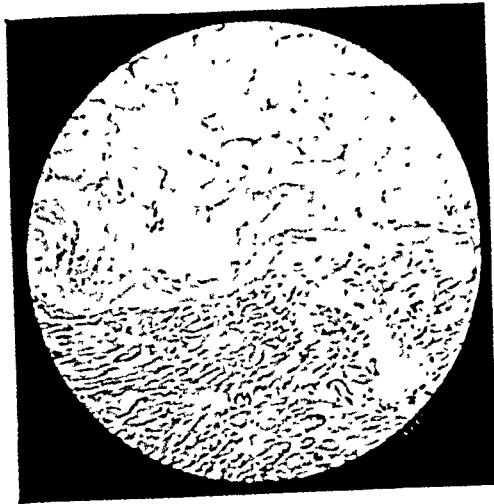
at Bellevue Hospital on March 4, 1913, with the diagnosis of hernia. Upon examination Dr. Woolsey found a small tumor in the region of the left pubic spine, which the patient said she had first noticed about two weeks before when she suddenly leaned forward at work and pinched it causing severe pain. On February 24 the pain had become so severe that she had to go to bed, and she had remained there until the time of her admission to the hospital. It gave the peculiar ovarian or testicular tenderness on pressure, and had not increased in size. The tumor gave no impulse on coughing and it was regarded at the time as a hernia of the left ovary. Upon operation, the tumor proved to be a small testis, curled on itself, and upon further exposure the vas deferens was traced up to the inguinal canal, which contained no hernal sac. There was no scrotum into which the testis could be transplanted, and it was thereupon removed.

The external genitals of this patient, including the vestibule, meatus and clitoris, Dr. Woolsey said, were those of the female type, with a much enlarged clitoris. The vagina was smaller than normal, the vaginal portion of the cervix was lacking, and both by vaginal and rectal examination and by combined examination, with one finger through an opening in the peritoneum at the internal ring, no uterus could be felt. A transversely placed structure, feeling like the organ removed, could be felt in the pelvis on the right side of the upper end of the vagina. On either side of the upper end of the vagina could be felt a cord like structure. The vas was traced in to the pelvic brim but it was not possible to palpate its further course.

At the time of the patient's admission to the hospital, her face had the appearance of that of a man's with a dark beard, closely shaven, and at the time of operation there was a distinct growth of hair on the face. This was removed from time to time by rubbing with some kind of stone. The chest was covered with quite a profuse growth of hair. There was no development of the breasts. She had never menstruated, but at varying intervals she had noticed a slight whitish discharge from the vulva, lasting but a few minutes and preceded by a peculiar sensation.

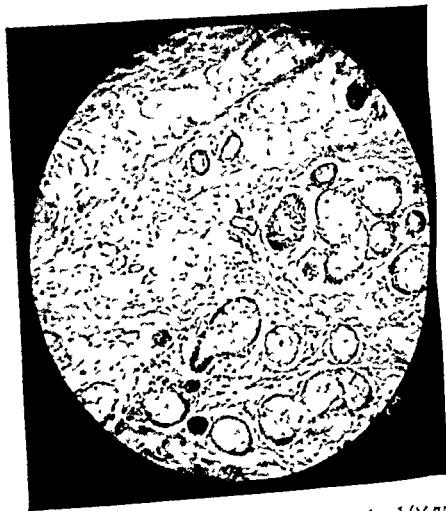
The specimen was reported on by Dr. James Ewing, as follows: "This specimen may be described as an undeveloped but otherwise complete testis. The testicular tissue forms an encapsulated, brownish mass, one-half by one cm. in size, which

FIG. 6.



Striped muscle and adipose tissue ( $\times 175$  diameter).

FIG. 7.



Glandular tissue, probably salivary gland ( $\times 75$  diameter).

FIG. 8.



Columnar epithelium, probably rudimentary stomach ( $\times 40$  diameter).

## PURPURA OF THE BLADDER.

REPORT OF A CASE WITH A DESCRIPTION OF THE CYSTOSCOPIC APPEARANCES.

BY FRANK KIDD, F.R.C.S.,  
OF LONDON,

Assistant Surgeon to the London Hospital.

**REPORT OF A CASE.**—Selina H., aged twelve years, was admitted to Sophia Ward, London Hospital, Nov. 30, 1910, with the history that on Nov. 29 at 8 P.M. she felt a sudden desire to pass water and during the act experienced a sharp stabbing pain starting in the left iliac region and spreading into the vulva. Between 8 P.M. and 9.30 P.M. she passed water four times, each time noticing a similar pain which lasted only as long as water was passing and ceased at once at the end of the act. At 9.30 P.M. she passed water again and this time inspected it. It was full of blood. An aching pain came on in the left iliac region when she went to bed and lasted all night and the whole of the next day. Urine was passed once in the night and five times during the next day up till the time of admission into the hospital at 5 P.M. on Nov. 30.

*Previous Health and Habits.*—Diphtheria five years ago, otherwise no serious illnesses. No hæmophilia. No scurvy. The patient lives in Poplar amidst poor and unhealthy surroundings. She has had a sore throat for some days before the onset of the haematuria and has felt "out of sorts."

*Examination.*—The patient looks ill and is pale and anaemic. The temperature is normal. Pulse and respiration rate normal. Tongue clean and moist. Heart, lungs, and alimentary system normal. There is follicular tonsillitis on the left side and some slight enlargement of the glands on the left side of the neck which are tender to the touch. The skin shows no petechiae.

The gums are healthy. There is deep tenderness over the bladder region, especially on the left side. The urine is full of blood clots and contains bright red blood diffused throughout. The patient was at once taken into hospital and put to bed. By the next morning the bleeding had disappeared and the pain had ceased.

straight incision outside of the spinal muscles. The left kidney was found to be almost completely destroyed with tuberculosis, there being a cheesy abscess in each calyx. The ureter was found to be dilated and markedly diseased as far as it could be followed through the existing incision, a distance of five inches. It was divided at this point with the actual cautery. A large probe was passed into the bladder, insuring the patency of the ureter, and then the cauterized end was ligated with catgut. The patient's condition was such that it was thought inadvisable to submit him to the added operation of removing the entire ureter, and it was hoped that with drainage into the bladder and the absence of fresh infection from the kidney, the ureteral infection might be taken care of.

Following the operation, the patient's course was satisfactory and the wound gradually healed. The cystitis, under local treatment, improved markedly. The man left the hospital in about seven weeks, having remained a month after the operative wound healed, for the bladder treatments. It was now three months since the operation and his general condition was excellent, there having been a gain of thirty pounds in weight. The bladder condition, too, had steadily improved, and now he had almost no subjective symptoms of the cystitis excepting slight pain at the end of micturition, which was not unduly frequent. About two weeks ago, however, the wound in the back broke down and has since remained open. At the present time there is a sinus, presumably leading to the ureter, which is lined with typical appearing tuberculous granulations.

In view of his marked general improvement and the steady progress of the bladder lesion towards recovery, was it advisable to temporize in dealing with the sinus, or should the remainder of the ureter be removed at once?

#### ENTEROSTOMY FOR INTESTINAL OBSTRUCTION FOLLOWING ACUTE APPENDICITIS.

DR. HARTWELL presented a girl, five and a half years old, who was admitted to the Presbyterian Hospital on October 15, 1912, with a well developed appendicular abscess of five days' duration, this being her first attack. Her past history was uneventful and she had always been a child of normal intelligence and mental activity. The routine physical examinations showed

cured and restored to health and has had no return of the bleeding up to date.

I regret I did not have the blood and throat cultures made and the coagulation times of the blood taken during the first week of the illness, but at the time I thought I was dealing with a case of tuberculosis of the bladder, and it was not till I had excluded this that I became convinced that the case must be considered as one of a purpura of the bladder mucous membrane.

This case is of interest from two points of view—that of urology and that of general pathology.

As regards the first, though many cases can be found in the literature of purpura accompanied by haematuria, yet I have been unable to find any case where cystoscopy has been performed and a description of the condition given, nor where the purpuric eruption has been proved to be confined to the bladder alone.

Urological literature is also full of unexplained cases of renal haematuria. Such cases may be mild single attacks or may be severe and relapsing, and certain authors have reported cases where one kidney has been removed for this condition and though submitted to minute microscopic examination nothing has been found to account for the bleeding. It is conceivable that some of these cases should be classed under the heading of purpas in which the purpuric eruption has occurred only in the kidney. It seems fair to argue thus by analogy from the case just described where the purpuric eruption was proved to be confined entirely to the bladder. *Cystoscopy in the above case proved that an appearance may be met with in the mucous membrane of the bladder exactly resembling a purpuric eruption on the skin which clears up like a simple purpura and which may be unaccompanied by any other sign of hemorrhage either into the skin or into any other mucous membrane or part of the body.*

That a purpuric condition can reveal itself by means of intestinal pain and intestinal hemorrhage unaccompanied or not accompanied at first by purpura of the skin has been brought home by recent reports of cases of intestinal hemor-

five weeks after the wound had almost closed, although there was always some discharge through it, the patient developed a condition resembling catalepsy; she refused to respond to questions and stared with dilated pupils, apparently taking no interest in her surroundings. This attack came on in the morning, shortly after breakfast, and at ten minutes past one in the afternoon she began to have localized convulsions of the right arm and face. The clonic spasms seemed to be of the cortical type, as they were both flexor and extensor in character. The pupils were widely dilated, immobile, with a horizontal nystagmus with the quick component to the right. There was marked twitching of the facial muscles, with winking of the lids and slight frothing at the mouth. The convulsions followed closely one after another, and were somewhat relieved by the inhalation of small amounts of chloroform. A lumbar puncture was done at 1.45 P.M., and twelve c.c. of clear fluid was withdrawn under moderate pressure, but without relief of symptoms. Dr. M. Allen Starr saw the case at 2.10 P.M., and considered the condition due to a cerebral embolism of a septic nature originating from either the appendicular abscess or the pneumonia. The convulsions lasted almost without interruption until five o'clock, and could only be controlled with chloroform. They were confined to the right side.

The child gradually recovered from the convulsions and on the following morning was again in the condition noted earlier in her illness, but with a marked increase in the mental apathy and irritability. No response could be obtained from her, and she seemed to have lost entirely her association with her surroundings. She failed to recognize her parents, and at times both they and the nurses and staff thought she was suffering from sensory blindness and deafness.

On November 30 another series of convulsions occurred, lasting one hour and confined to the left side. From this time on the child's condition was pitiable. In no way could she be aroused to take any notice of her surroundings, and at times she would suffer from violent hallucinations and cry out in fright, covering her face with her hands and pleading to be saved from imaginary injuries. She was emaciated and feeble. Her appetite was very capricious; what was eaten was apparently well digested, and practically all fecal matter was passed per anum,

found in purpuric lesions and it is well known that any of the acute specific fevers may be met with in a hemorrhagic form. But in many cases the eruption may be caused by the toxins of the bacteria as the bacteria have been found in the blood and not in the lesions, or have been found only in some local focus, as for instance in a diphtheritic or streptococcal pharyngitis or in a local tuberculous lesion.

At first sight the eruption in this case appeared as though it might be a manifestation of the onset of tuberculosis; the "von Pirquet" tuberculin reaction was positive, and the case seemed to fit in very well with the descriptions of tuberculous purpura given by Bérard et Roubier, *Gaz. des Hôpitaux*, 1907, lxxx, 1635-1671. They described three forms of purpura occurring in the course of tuberculosis.

1. A pre-tuberculous purpura which is the first sign of the onset of tuberculosis, hypothetically due to the circulation of tuberculin in the blood. In this connection it is interesting to note that a number of cases of tuberculous kidney have as an onset symptom a profuse painless haematuria.

2. A form of purpura which appears during the course of a frank tuberculosis and hypothetically due to secondary infection of the tuberculous foci.

3. A form seen during the terminal cachexia.

This hypothesis was rejected on the following grounds: no tubercle bacilli could be found in the urine, and the case has not gone on to tuberculosis of the genito-urinary tract. A second hypothesis seemed more acceptable, namely that the hemorrhagic eruption was due to the absorption of bacterial toxins from the throat. The child had a definite follicular tonsillitis on the left side and the glands of the neck were swollen and tender. Unfortunately no cultures were made of the throat. Certain bacteria have been proved to be capable of producing poisons which can cause hemorrhagic eruptions, for instance the streptococcus by Klein, the bacillus of Friedlander by Oliver, the typhoid bacillus by Andrewes. I have myself observed a case of erysipelas which proved fatal from hemorrhage into the stomach and duodenum. How does the

When the patient was admitted to the Presbyterian Hospital, his face was entirely healed, but greatly disfigured and scarred. The nose, including its nasal and cartilaginous portions, was entirely missing, as was also the projection of the frontal bone forward. There was a single small opening into the nasal cavity, admitting a probe. The left nostril was entirely gone; its edge was attached to the bone underneath, while one-half of the right nostril remained and projected forward in a teat-like process. The defect in the soft parts extended up to within one inch of the frontal bone, and measured one inch in its transverse diameter and an inch and a half vertically. Any plastic operation to reproduce the nose in such a case necessitated the use of some bony support. Morestin had carried out a procedure of grafting a rib into the soft parts of the forehead, and then turning down a flap, containing the implanted rib, to form the nose. This did not seem advisable here because of the scars on the forehead, and the disinclination to augment the disfigurement by additional scars, and it seemed a more feasible plan to graft a finger into the defect. The man's condition was pitiable; he could get no position because of the deformity, and went around with a handkerchief tied about his face to hide his disfigurement.

The operative procedure followed by Dr. McWilliams in this case was that described by Finney and McGraw. The patient's head and shoulders were immobilized in a plaster-of-Paris splint the evening before the operation, and this splint was then cut down on one side so that it could be quickly removed in case of any accident during anaesthesia. This splint proved of great assistance in immobilizing the attached hand and arm immediately after the operation. A knife inserted into the defect separated the soft parts from the bone beneath, the incision being extended up to the frontal bone and the edges of the defect were pared all about the margins. As a graft, the left ring finger was chosen. After applying an Esmarch bandage about the arm, the nail of the left ring finger was removed and the tissues scraped away until the bone was exposed. The metacarpophalangeal articulation was then opened by a posterior longitudinal incision, the posterior extensor tendon was divided, the joint opened and the head of the metacarpal bone removed. After division of the anterior tendons and the lateral ligaments of the joint, the finger was free, but was still united to the soft parts and nourished by the uninjured digital vessels. The skin was removed from the

malaise, pains all over the body and fever. These are soon followed by a purpuric eruption, joint pains and effusions, gastro-intestinal pains and hemorrhages, slightly albuminous and sometimes blood stained urine. The disease runs a course of from two to eight weeks and is followed as a general rule by complete recovery.

*Infective purpura* is of a severe typhus type and death is almost invariable.

*Wehrlof's purpura* is met with in children from five to fifteen years of age, chiefly in females. There are no prodromal symptoms, no malaise, no fever, no pains all over the body. Recovery is the rule. There is an acute form which is all over in a fortnight, and a chronic relapsing form which may last much longer. Hæmaturia has not been described.

The case reported above fits in most closely with the descriptions of Wehrlof's purpura, but seeing that hæmaturia has not been described in this form of purpura it does not exactly tally.

Summing up I am inclined to think that this case was one of secondary purpura confined to the bladder and arising in a bacterial infection of the tonsil though it is possible to look upon it as a case of Wehrlof's purpura.

First, it emphasizes the fact that this condition of abnormal involution or chronic mastitis (with the production of masses, which histologically may be classed as fibro-adenomata or adenofibromata) is a very important factor in the development of cancer and must therefore be considered as a precancerous condition or stage.

Second, it illustrates the fact that in these cases cancer may begin in one part of the gland while such a change may not be found in any other part of the gland.

Third, it emphasizes the fact that the detection of such a cancerous change may require the examination of many sections.

Fourth, this being true, it is evident that diagnosis by means of the frozen section must be subject to error in a certain proportion of cases.

Doctor Syms has always maintained that reliance on the frozen section is not justifiable in these cases. In this particular case examination of several sections of the hardened specimen in the laboratory failed to reveal the carcinoma. How much less reliable would have been a hastily made examination of a frozen section!

#### TUBERCULOSIS OF THE BREAST.

DR. JOHN A. HARTWELL reported the case of a married woman, twenty-three years old, a native of Roumania, who gave no family history of either tuberculosis or cancer. She had one child, eighteen months old, which she had nursed for one year. Six weeks ago she first noticed a large, hard lump in the right breast, which at one time was markedly reddened and extremely tender. This was treated at a dispensary with a binder and massage, and had gradually decreased in size. About two weeks ago she began to have pain in the wrist and legs, about four inches above the ankle joint. These areas became red and tender; she felt feverish and was unable to walk because of the pain. During the past fortnight she had been unable to do her house-work, and had suffered from marked anorexia. Her chief complaint was swelling in the right breast, and swelling and pain in both legs between the middle and lower thirds.

Examination of the joints and skin showed a rheumatic inflammation, which apparently had no connection with the breast lesion. There was no evidence of tuberculosis in the lungs or

sidered. Both breasts were removed by the old marginal incision—sometimes called Thomas's incision—preserving the nipple and integument in compliance with a request for a cosmetic result. The appearance of the breasts was very good from that standpoint, and the scars were scarcely appreciable.

#### DIFFUSE ADENOFIBROMA OF BOTH BREASTS.

DR. SCHLEY presented a woman of forty-five who was admitted to the hospital on February 27, 1913. She was married, but had had no children. Her mother died at the age of fifty-eight with "cancer of the glands of the neck."

The patient complained of some hardening of the left breast, with occasional stabbing pains and some swelling. Her observation of the condition began three weeks before her entrance to the hospital, when she noticed that the breast seemed slightly swollen and tender, but without redness or signs of inflammation. Upon examination, the left breast showed marked thickening of the tissues under the nipple and in the lower and outer quadrants, with slightly fuller outline. This area was moderately tender. There was no retraction of the nipple nor palpable axillary glands. The feel was that of matted and enlarged glandular elements, and a diagnosis of adenofibroma was made. Frozen sections at the time of operating confirmed this diagnosis, and a full third of the breast was removed.

The right breast showed a similar condition, but the area of induration was more limited. Nothing had thus far been done with this breast, but the patient was being kept under observation.

Dr. Schley said the practical questions to decide in dealing with benign conditions of the breast was in which of them were malignant changes likely to occur, which could be treated by local excision, and which were better off with removal of the breast? Most of these patients were over 40 years of age, a time when we looked for malignant changes. The simple cystic conditions, with single or multiple cysts, were distinctly benign and required only local excision unless associated with adenomatous hyperplasia or the parenchymatous hypertrophy of Bloodgood. Adenomatous changes, whether of the adenomasfibroma or the adenocystic type, were suspicious, even if the epithelium had not dipped beneath the basement membrane, and if associated with parenchymatous hypertrophy to any extent, the removal of the

At the time of his admission, he complained of intense abdominal pain. Examination showed retraction and pronounced rigidity of the abdomen, more or less generalized. His general condition was excellent; his temperature was normal; there was no leucocytosis. At operation an ulcer was found about a quarter of an inch beyond the pyloric vein on the anterior surface of the duodenum. This was punched out and was surrounded by a moderate amount of induration. The ulcer was excised, and a pyloroplasty, as described by Finney, was done.

For 48 hours following the operation the patient vomited considerably, and his stomach was washed out every twelve hours. The contents of the stomach were dark brown. A diastasis of the upper recti developed, and a secondary closure of the wound was done on the fourteenth day. His further recovery was uneventful and he has been free from symptoms since.

#### ŒSOPHAGO-GASTROSTOMY FOR CARDIOSPASM.

DR. LAMBERT presented a woman, forty years old, who was admitted to the medical division of the Presbyterian Hospital on April 10, 1912, with the diagnosis of carcinoma of the stomach and a history of persistent vomiting and progressive and marked loss of weight. The vomitus consisted of the food just taken, unchanged. A test meal showed 190 c.c. of thick fluid, with mucus, acid in reaction. No free hydrochloric acid; considerable lactic acid and some blood, with many bacilli resembling the Boas-Opler bacillus.

The patient was transferred to the surgical division on April 16 and an exploratory laparotomy was done, which showed that the stomach was normal. The appendix was removed. Following this operation there was no abatement of the symptoms. and ten days later the patient was sent back to the medical ward, where on May 1 the diagnosis of a dilated œsophagus with cardiospasm was made with the X-ray after the ingestion of bismuth. She was again sent to the surgical division, and as her weight had fallen to 74 pounds a gastrostomy under cocaine anaesthesia was done. Frequent attempts were made to have the patient swallow a string, but these were all unsuccessful. Dr. Stevens finally succeeded in passing a string upward through the cardia via, the gastrostomy opening, by means of a cystoscope, and Dr. H. H. Janeway, with the aid of the œsophagoscope, drew this string upward out through the mouth. Plummer apparatus

chronic mastitis with changes that would have gone on to carcinoma. Subsequently, he found evidences of actual carcinomatous changes. In the other breast a focus which was positively malignant was also found.

There was no question, the speaker said, that breasts of this type should be removed in their entirety, as they offered a beautiful illustration of an inflammatory condition undergoing malignant degeneration.

DR. SCHLEY, speaking of tuberculosis of the breast, said that in a review of the subject in 1903 he had found 304 cases recorded in the literature. Since then perhaps twelve or fifteen more had been reported. DR. POWERS, of Denver, in his last article, reported two new cases, and DR. SCHLEY said he had recently seen two in which the breast infection was secondary to tuberculosis of the ribs. The infection in these cases was either haemogenous or by way of the lymphatics or nipple. DR. POWERS had only seen four cases in his own experience and DR. BRILL had seen one or two. In most of these cases a spontaneous cure was unknown.

DR. CHAS. L. GIBSON said that changes in the epithelium in the carcinomatous age indicated a very dangerous condition, and such conditions at any time were likely to become malignant. After the age of 35 or more, a disturbance of the breast, due to epithelial changes, should be held to be cancerous until proven to be otherwise. It was better to occasionally sacrifice a healthy breast than to allow a woman with a cancer to go unoperated. That, DR. GIBSON said, was the position which he took in his paper on the subject which he read before this Society a number of years ago.

DR. LEE, in closing, said in reply to a question that while the precancerous condition might be recognized in frozen sections, the difficulty was that such sections were usually taken from one area of breast tissue, whereas sections from different areas should be carefully examined before we could positively exclude precancerous changes or true carcinoma.

#### UNDESCENDED TESTIS IN A HERMAPHRODITE.

DR. GEORGE WOOLSEY reported this case and showed the specimen. The patient was a seamstress, twenty-four years old, a native of Austria, who was admitted to one of the female wards

out of the gastrostomy. She was able to take solid food by the mouth on the 33d day. She had lost some weight after the operation, which she has since regained. There was occasional regurgitation of food, but this is becoming less frequent.

DR. WILLY MEYER said there were a certain number of cases of cardiospasm that were intractable and did not yield to stretching, and demanded operative interference. The case shown by Dr. Lambert was interesting in that the obstruction was attacked from below and that sufficient space was obtained to do an anastomosis. Dr. Meyer said it had been his good—or bad—fortune to meet with three of these cases within the past few years. In one of these, a woman, where it was found impossible to enter the cardia and dilate the œsophagus, he did a thoracotomy and after loosening the pouch he made a double plication of its anterior wall. The patient made a good convalescence and spontaneously regained the ability of swallowing fluids and later solids. Subsequently, she developed, after an acute pneumonia, an œsophageal fistula in the thoracotomy scar, and finally died from an infection of the posterior mediastinum. She had no difficulty in swallowing up to the end. In the second case practically the same method was followed, but a single plication made. In the third case there was a slight stricture of the cardia, most likely following a peptic ulcer.

In the second case the first operation was followed by only temporary improvement, and six weeks ago Dr. Meyer did a second thoracotomy, cutting out a large aperture in the chest wall in order to gain access to the part. Dense adhesions in the posterior mediastinum prevented a good exposure of the œsophagus. The œsophageal foramen of the diaphragm was incised and an intrathoracic cardioplasty done, after the method of Heinicke-Mikulicz at the pylorus. The patient made a good recovery and his ability to swallow was much better than it was before the operation. The speaker said he did not know whether the case would go on to complete recovery, but the point he wished to emphasize was that we could treat the cardia in much the same way as we could the pylorus. The approach to the cardia was certainly easier through the thorax than through the abdomen.

DR. LAMBERT, in closing, said the clamp was chosen in this case because it seemed to offer the better safeguard to preventing the contents of the œsophagus from entering the pleural cavity

is attached to a larger mass of fibro-cellular tissue, one by two cm., which contains portions of epididymis and rete testis. On section, the testicular tubules are normal in form and arrangement, though small in size. There are scanty interstitial cells in the stroma. There is no evidence of spermato-genesis. The tubules of the epididymis have normal, large, high, cylindrical, ciliated epithelium. There are many ducts lying in the dense fibrous tissue and containing pus. The surrounding connective tissue is very cellular and extensively invaded by plasma cells and lymphoid follicles."

The patient must therefore be regarded as a male pseudo-hermaphrodite.

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*Stated Meeting, held at the Presbyterian Hospital,  
March 26, 1913.*

The President, DR. CHARLES L. GIBSON, in the Chair.

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#### PYOPNEUMOTHORAX.

DR. JOHN A. HARTWELL presented a man, twenty-three years old, who had an attack of pneumonia in 1910. Aside from this there had been no past illness of importance, and there was nothing to indicate a tubercular infection. He was admitted to the Presbyterian Hospital early in December, 1912, having been sick for six days with the symptoms of pneumonia on the right side.

On admission, the patient looked acutely ill. His breathing was shallow and painful, and he suffered from a severe cough, with dirty brown expectoration. His temperature was  $102^{\circ}$ ; pulse, 102; respirations, 28; leucocytes, 31,600, with 93 per cent. of polynuclears. The physical signs over the right chest were those of a pyopneumothorax, and they were confirmed by aspiration, both pus and air being withdrawn through the exploring needle. No tubercle bacilli were found in the sputum or in the pus, the latter showing long chain cocci in smears, but no growth on culture.

In the absence of any evidence of tuberculosis, and in view of the acute onset, it was believed that the pyopneumothorax followed either a pneumonia or an abscess of the lung. A free

## BILATERAL CALCULOUS PYONEPHROSIS.

DR. WOOLSEY presented a woman who had already been shown by him at a meeting of the Society on November 22, 1911 (*ANNALS OF SURGERY*, vol. iv, page 450). She was forty-nine years old at the time when she was admitted to the Presbyterian Hospital on July 17, 1911. She then gave a history of having had mild attacks of pain in the right kidney region for twenty years prior to March, 1896, when she was operated on at Bellevue Hospital, where three stones, including a large, pipe-stemmed one, were removed from the right kidney. The kidney consisted of a thick shell, containing several large pus pockets. Her pain persisted, and an X-ray showed stones in both kidneys. A right nephrectomy was planned, but a ureteral catheterization showed that the right kidney was apparently the better of the two. In November, 1906, the patient was again operated on, this time at the Presbyterian Hospital, where one stone, the size of an olive pit, and several smaller ones were removed from the right kidney. At this time two small pockets of pus were opened, and the kidney was drained. On the 6th of the following month the left kidney was opened, and three or four calculi removed. This kidney was found to be much enlarged and adherent, and filled with pockets of thick, greenish-yellow, foul-smelling pus. After this operation a sinus persisted for nearly a year. The wound on the right side had healed rapidly, and the patient gradually gained in strength.

After the above operations the patient had occasional slight attacks of pain in the right lumbar region, and eight days prior to her readmission to the hospital she was seized with a sharp, severe pain over the old wound on the left side, followed by the appearance of a hard but not very tender mass. On the day of her admission this swelling broke and, with the spontaneous evacuation of a large quantity of greenish pus, her pain ceased. An X-ray showed stones in both kidneys, more pronounced on the left side, and there was also a stone in the left ureter at the brim of the pelvis. In the middle of the left lumbar scar there was a small sinus discharging yellow pus, without urinous odor. On bilateral examination a mass twice the size of the kidney was felt in the left upper quadrant; it could be pushed forward from behind, was firm and smooth and not very tender.

On July 28, 1911, Dr. Woolsey opened the old scar, evacuat-

into the pleura from the lung ceased in about two weeks, and thereafter the condition was treated by simple drainage. Four weeks after the operation the discharge had entirely stopped, and the wound was completely healed.

From the physical signs it seemed that the expansion of the lung was very incomplete, but there was no evidence of either fluid or air in the pleural cavity, and suppuration had entirely ceased. The patient's condition was satisfactory at the present time, two months after leaving the hospital.

This method of treatment, Dr. Hartwell said, had been followed in a second case of pyopneumothorax following pneumonia, with an equally satisfactory result. The principle underlying it was that the chest cavity was not opened until the perforation in the lung was sealed, and during the interval required for this, the mechanical compression of the lung and the ill-effects of the suppuration were minimized by the negative pressure maintained and the frequent withdrawal of the pus. Presumably, the closure of the lung perforation took place by its becoming adherent at the site of the opening rather than by an actual healing, though the latter took place subsequently. It was impossible, however, to completely clear up the infection by simple aspiration, and ultimately a thoracotomy had to be done, but the principle of suction had to be maintained even then.

#### TUBERCULOSIS OF THE KIDNEY: NEPHRECTOMY.

DR. HARTWELL presented a man, twenty-seven years of age, who was admitted to the Presbyterian Hospital on December 11, 1912. He had suffered from symptoms of cystitis for eleven months, and about five months ago the diagnosis of a left-sided tuberculous kidney was made, and tubercle bacilli were demonstrated in the urine. At the same time he was told that he had a tuberculous process in the apices of both lungs, and for that reason he was advised against operative interference. He grew progressively worse as far as the urinary symptoms were concerned, and on admission was suffering constantly and severely from the cystitis.

Examinations with the cystoscope and the X-ray confirmed the diagnosis of the kidney lesion, but there were no definite signs of pulmonary tuberculosis.

A nephrectomy was done on December 20, 1912, through a

in character. It persisted about a month and confined her to bed for three weeks. She then remained free from pain until about one year ago, when it recurred in the same location, but this time it assumed more of a dragging character and extended to the left side of the back and the left lower extremity. She had occasional attacks of vomiting, and the pain had persisted, more or less, up to the present time. Three weeks ago, following a heavy meal, she had a sudden attack of faintness; she was hungry for air and looked very pale. Following this attack she vomited three times in the course of two hours, and on one of these occasions the vomitus was very profuse and contained much clotted and fluid blood. For a day or two after this attack she passed dark material (blood?) in her stools. There was no further history of haematemesis or melæna. During the past few years she had gradually lost flesh and strength, her weight having decreased perhaps 40 pounds. The patient gave no alcoholic history. Her appetite was good; the bowels regular; no diarrhoea. She had been married for 26 years and was the mother of four healthy children. No miscarriages.

Upon admission to the hospital, the patient was thin and sallow. The superficial lymph nodes were not enlarged. The abdomen was full and rounded, and moved easily with respiration. There were no enlarged veins; no peristalsis. The spleen could be felt one inch to the right of the midline and one inch below the umbilicus, and its edge could be felt indefinitely in the posterior axillary line. Its surface was smooth; there was no tenderness nor rigidity.

An examination of the blood gave 2,060,000 red blood cells, 5,800 white blood cells, 58 per cent. of polynuclears and 45 per cent. of haemoglobin. The stools were examined repeatedly for occult blood, with negative results. On the 28th day after admission an examination of the blood showed 2,800,000 red blood cells, with 65 per cent. of haemoglobin. During this time the patient had a slight temperature, varying from 99° to 100°, and she had had one attack of pain in the left upper quadrant, of several hours' duration. There was no resistance nor rigidity.

The case was regarded as one of splenic anaemia, and a splenectomy was done on the 29th day after admission. The spleen was found to be of immense size and attached to the posterior and lateral abdominal walls and to the diaphragm by many

nothing abnormal excepting the usual signs of an abscess in the right lower abdomen. There was no evidence of either tuberculosis or syphilis.

An immediate operation was done, and a small abscess with a chronically inflamed appendix was found. The appendix was removed, ligating and cauterizing the base, but not inverting it. A small double tube drain was placed in the abscess cavity.

On the second day following the operation the child developed signs of intestinal obstruction. This was thought to be a paralytic ileus, but it failed to respond to the usual remedies, and at the end of the third day an enterostomy was done by opening through the left pararectus line and inserting a small tube into the first presenting coil of small intestine through a small stab-wound, which was surrounded by a purse-string suture.

Following this procedure, the patient's condition was satisfactory, the intestinal drainage being free and the obstructive symptoms subsiding. Three days later, methylene blue given by the mouth did not appear in the enterostomy wound until the ninth hour; the discharge, however, was that from the upper intestine, and there was a very considerable digestion of the skin. After the seventh day the fecal discharge from the enterostomy wound grew progressively less, and there was some faeces passed per anum. Gradually this increased in amount, and the amount of discharge through the enterostomy wound became very small, so that the skin healed up and only one dry pad a day was required to keep the parts clean. The child's general condition, however, was very unsatisfactory. She ate only fairly well, and there was very rapid and severe emaciation until she appeared like a child in the advanced stage of starvation. She was very restless, irritable and mentally depressed, and after two weeks she developed a bronchopneumonia which lasted about a fortnight. Her condition was strongly suggestive of pulmonary tuberculosis, but no bacilli could be found and the signs in the lungs gradually cleared up without improvement in her general condition. Her mentality was very unsatisfactory: at times she was excessively irritable or she might lie for hours in deep apathy. The condition was somewhat suggestive of a tubercular meningitis, but thorough examination of the eye grounds, the spinal fluid and the skin reaction all yielded negative results.

On November 25, seven weeks after the enterostomy, and

TRANSACTIONS  
OF THE  
PHILADELPHIA ACADEMY OF SURGERY.

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*Stated Meeting held March 3, 1913.*

DR. GWILYM G. DAVIS, President, in the Chair.

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TOTAL EXTRIPATION OF THE EXTERNAL GENITALIA FOR  
CARCINOMA.

DR. E. HOLLINGSWORTH SITER presented a patient in whom a total extirpation of the external genitalia for carcinoma had been done.

SUBDIAPHRAGMATIC ABSCESS.

DR. DUNCAN L. DESPARD read a paper with the above title, for which see page 334.

DR. JOHN H. JOPSON said that it had been his misfortune to see a good many cases of subphrenic infection, including cases following appendicitis, ruptured gastric and duodenal ulcers, operation for cholecystitis, and one case of probable kidney infection,—12 cases in all, with a mortality of 58 per cent. !

Appendicitis is probably the most frequent cause of subphrenic infection in this country, although it frequently follows the accident of perforating gastric or duodenal ulcer. Appendicitis is easily the most frequent cause in children, as was shown in his study of all the reported cases up to 1903.

Some distinction should be made between subhepatic and subphrenic abscesses, because the symptoms of the latter are often more characteristic. Several times in subphrenic infection he had found an early inflammation of the pleura present, as shown by pleuritic pain, friction rub, fine râles and an early involvement of the lung. In many cases of true subphrenic abscess, however, these symptoms are transient or absent, as are nearly all of the classical symptoms detailed by Dr. Despard. A persistently high temperature and the physical signs of a

there being very little discharge from the enterostomy wound, though always some. Repeated examinations of the eye grounds, the spinal fluid and blood and complete physical examinations failed to show any evidence of organic lesion nor of tuberculosis or syphilis.

On December 22, the condition having continued the same, she was seen by Dr. Theodore C. Janeway, who offered the suggestion that possibly the loss of calcium salts and other nutritional disturbances due to the high enterostomy might be causing the malnutrition and the cerebral unbalance. On the following day, despite the very small discharge through the enterostomy wound and despite the wretched condition of the patient, the intestinal opening was closed. The child stood the operation well, and immediately following it the administration of calcium lactate was begun. The operative wound healed kindly, with only superficial suppuration, and the patency of the intestinal canal seemed normal. Her convalescence from that time on was perfectly satisfactory, and within two weeks she was entirely normal and rapidly gaining weight. At the present time she appears in every way like a robust child of six years, being quite up to the average both physically and mentally.

Unfortunately in this case, Dr. Hartwell said, no studies were made of the metabolism during her illness, but if the malnutrition and particularly the loss of calcium due to the high enterostomy did not bear a causal relation to the symptoms exhibited, then her improvement when these factors were corrected was a most curious coincidence. At any rate, the subject was worthy of serious experimental study.

Dr. Hartwell expressed his indebtedness to Dr. Eliot, on whose service these cases occurred, for the privilege of reporting them.

#### RHINOPLASTY BY FINGER.

DR. CLARENCE A. McWILLIAMS presented a man, forty-five years old, who was admitted to the Presbyterian Hospital on September 5, 1912. Two years before, while working as a stationary engine oiler, his right arm was caught in a belt and his face was drawn in so that it was struck by the spokes of the wheel, annihilating his nose. He was taken to the Long Island City Hospital, where he spent a year and submitted to eleven operations.

in these cases was made over the appendix, and whenever pus was found running up toward the liver the case was classed as one of subphrenic abscess. It is correct to distinguish between these cases and those of true subphrenic abscess. If he were to add to his relatively small number of subphrenic abscesses the large number of cases of appendicitis in which at operation he had found pus extending up toward the liver he should have a very large number of subphrenic abscesses with a very low mortality, instead of a few cases with about the average mortality.

A subphrenic abscess in the left region of the diaphragm he had seen only in one case of a child of two years, at the Children's Hospital in the service of Dr. Hutchinson, in 1906: this apparently was the result of tuberculous peritonitis. The abscess had discharged at the umbilicus before the child was admitted to the hospital; with Dr. Jopson's assistance he explored the sinus, but a fecal fistula developed within a week, and the child died about a month later.

As to pleural effusion as a valuable sign in the diagnosis of subphrenic abscess, a patient with stab-wounds of the liver on whom he operated last year for Dr. Frazier at the Episcopal Hospital developed thoracic signs during convalescence; but although his chest was tapped on several occasions at the point indicated by the consultant (Dr. Geo. W. Norris) no fluid was found at any time, nor did he have any other evidence of subphrenic or hepatic abscess. He carried a septic temperature for a long time, and all the physical signs of pleural effusion were present, but he finally recovered.

Dr. Despard has spoken of the danger of infecting the pleura in doing a transpleural operation for drainage of a subphrenic abscess, and while no doubt this danger is greater in cases of subphrenic abscess than in cases of hepatic abscess yet if the technic is proper the danger he believed was overestimated. Dr. W. W. Ashhurst had a large experience in these operations when he lived in Mexico, and devised the following technic: after subperiosteal excision of the rib selected, a curved needle is passed through both layers of the pleura in the costo-phrenic sinus and is made to penetrate the diaphragm; the fact of penetration is ascertained easily by the sensation when the needle catches in the diaphragm. A row of such sutures is inserted along the upper margin of the space left by excision of the rib, and not

entire circumference of the distal phalanx, and the tip of the phalanx nipped off with the rongeur. The finger was then slipped into place, the extremity of the last phalanx extending up to the frontal bone under a bridge of undivided soft parts. No suture was used to attach the phalanx to the frontal bone. A longitudinal denudation was made on each side of the second phalanx, about one-fourth of an inch wide, to which the edge of the cheek on one side was sutured and on the other that of the nostril, the defect between the cheek and nostril being filled in by the skin from the dorsal surface of the finger. The first phalanx was left unattached, as it was later to be turned backward. Interrupted silkworm sutures were used. A plaster-of-Paris splint was then applied about the head, arm and chest.

For two days after the operation the pain in the arm was severe; after that the arm, so to speak, fell asleep, and there was no further discomfort. On the fifteenth day after the operation one of the digital vessels on one side of the finger was tied under 4 per cent. novocain anaesthesia, and six days later the finger was amputated through the metacarpophalangeal articulation, using novocain locally. No attempt was made to close the proximal end of the finger at the time. Heat, in the shape of hot cloths, was applied to the finger for twenty-four hours. Subsequently there was some necrosis of the soft parts at the end of the first phalanx, but not to any great extent.

Eight days later the first phalanx was flexed to a right angle with relation to the second phalanx, and its tip was sutured in this position to the bone behind, while the soft parts covering it were also turned backward and sewn to the freshened lower border of the nasal defect. Sixteen days later it was necessary to remove the greater part of the first phalanx on account of necrosis. After this operation there was some infection of the finger, the pus from which escaped through several points in the line of the scars. This infection, however, was soon controlled. The tendons of the transplanted finger were not disturbed at any time during the various procedures, and were still in place.

At the present time, while the man is still far from handsome, his appearance is vastly improved over what it was prior to the operation. There is no evidence, now three months after the operation, of any regrowth of the nail. There was a small opening into the nasal cavity, but not sufficient for respiration.

from above downward and from below upward indicated a tumor of the carotid gland.

A few years ago he made a report of a case of tumor of the carotid gland upon which he had operated. In that case he was obliged to tie the common carotid artery and as a result of the ligation hemiplegia developed. He stated on that occasion that he would never again remove one of these growths, a statement which is proof of the truth of the saying of James Russell Lowell, that "one should not prophesy unless one knows!" In spite of that prophecy he now reported another case. There are very few cases of carotid tumor on record, 32 altogether. The mortality has been 25 per cent. and in 6 of the cases there was recurrence. In several of the more recent cases it was found possible to remove the growth without tying the common carotid.

Again, these growths when they begin to show rapid enlargement have become malignant and if let alone will produce death. He determined to operate on this patient and succeeded in getting the gland out of the carotid bifurcation without tying the common carotid, although he was forced to tie the external carotid. The pathological report shows that the growth is a perithelioma.

#### MYXOCHONDRO-ENDOTHELIOMA OF OCCIPITAL BONE.

DR. DA COSTA presented an enormous tumor which he had removed from the nasopharynx of a colored woman aged twenty-four years. The pathological report shows it to be a myxochondro-endothelioma. It was so large that it filled the entire back of the throat and between it and the dorsum of the tongue it was not possible to pass the handle of a spoon laid flat. The woman was in immediate peril of suffocation. This growth had lasted for 6 years. He performed a preliminary tracheotomy and a few days afterward tied each external carotid artery and explored to see if he could possibly remove the growth without serious mutilation of the patient. It was necessary to remove the right half of the upper jaw, because the growth had invaded the posterior part of the antrum. The growth sprang from the basilar process of the occipital bone and had fused with the palate bone, the soft palate and a part of the superior maxillary bone on the right side. The removal was accomplished with difficulty and in spite of the carotid ligation occasioned severe hemorrhage.

thereupon resolved to try the lateral anastomosis, which Bernheim, of Johns Hopkins, had done eleven times with his transverse method. The speaker said he realized the possibility of an arteriovenous aneurism developing, but this had not occurred in any of Bernheim's cases.<sup>1</sup> It did not seem reasonable to expect that there would be any improvement in the stump of the second toe, the vessels of which were probably almost completely occluded, but it was hoped to get enough blood down to the foot to obviate the threatening gangrene in the foot and the other toes. The result of the operation entirely justified this reasoning. If amputation should later become necessary through the failure of the anastomosis, then it was hoped that enough blood would get down into the leg to assure the success of the amputation. The fact should not be lost sight of that the arterial blood also has to overcome the valves in the veins.

On Febrary 11, 1913, Dr. McWilliams anastomosed the femoral artery and vein laterally, according to Bernheim's method, making a transverse incision with a small cataract knife through one-third the diameter of the artery. The anastomosis was made three inches below Poupart's ligament, just underneath a visible valve in the vein, the artery being situated in front of the vein. Four Crile carotid artery forceps were first applied, above and below the orifice. The opening in the vessels, by the action of their longitudinal fibres, at once became oval. The walls of the artery were twice their normal thickness, and its lumen was small. The contained blood was immediately washed out with salt solution, and liquid vaseline was smeared inside and outside their lumina. An oiled, continuous, fine silk suture was then passed, with the knots outside, uniting the edges. The vein was ligated permanently, proximal to the anastomosis. After removal of the Crile clamps there was no leakage. The pulsations were seen and felt to go down the vein as far as the latter could be followed in the incision. The wound healed primarily.

For five days after operation the pain was agonizing, requiring the use of considerable morphia. The most striking change noted was in the temperature of the foot, which became normally warm. The patient was kept in bed for fourteen days,

<sup>1</sup> Bernheim: Jour. of the American Med. Ass'n., Feb. 1, 1913, page 360. ANNALS OF SURGERY, Nov., 1912; also Feb., 1912.

on May 13 seemed to be a climax. This pain was accompanied by nausea and vomiting, constipation and a diminished amount of urine. This lasted until Wednesday, May 15.

Monday, May 13, the temperature was 99 degrees, pulse 84 and respiration 12. The very slow respirations were said to be due to morphin sulphate. As time went on from Monday, May 13, to Wednesday, May 15, the abdomen continued to become more and more distended and the urine smaller in amount and of redder discoloration. Tuesday, May 14, during the morning she again had a very sudden, severe and excruciating pain in the lower abdomen which also radiated to the shoulder and back. Wednesday morning, May 15, the abdomen became greatly distended and was quite tender and sore and more or less painful, but the pain was not so severe as during the previous few days. There were no peristaltic sounds audible. The urine was diminished in amount. The bowels had not moved and she had not passed flatus.

Operation, May 15, 1912. An incision was made in the right upper rectus close to the semilunar line. On opening the peritoneum the abdominal cavity was found to contain free fluid, of the appearance and nature of bile. The "bile" spurted from the wound on incising the peritoneum. In the pelvis was found a cloudy, bile-stained fluid. The gall-bladder was perforated and had discharged its bile content and 10 or 12 stones into the abdominal cavity. About 250 gall-stones of greatly varied sizes, the majority of which were small, split-pea size and the largest of which was about  $1.50 \times 2.00 \times 0.75$  cm., were removed from the gall-bladder. The gall-bladder "rupture" occurred on the inferior surface near the cystic duct. The gall-bladder mucosa was inflamed and the wall thickened. There were fine adhesions in many places. The bile ducts were patulous. A rubber drainage tube was sutured to the gall-bladder wall entering the bladder. There was no attempt made to sew up the rent in the gall-bladder. A small puncture was made in the hypogastrium and a rubber catheter inserted into the pelvic cavity, for drainage purposes. The peritoneal cavity was not washed out, the excess of bile being mopped out with gauze sponges.

May 15. White blood cells 10,000.

May 22. Culture of fluid from ruptured gall-bladder showed staphylococcus and streptococcus and bacillus coli

lapsed coils of gut in the right pelvis. Upon following these up, he came upon a band encircling the gut, which was dilated proximally. Upon separating the adhesions, gas was observed to enter the collapsed gut. The wound was thereupon closed, and, at the completion of the operation, fæces were passed through the colostomy opening.

Following this operation, all the patient's symptoms subsided. Within a few days fæces were passed per rectum as well as through the colostomy wound, which showed no inclination to close. The fecal discharge through this wound produced severe irritation of the adjacent skin, and the boy was losing weight. A month later Dr. McWilliams tried to close the fistula by dissecting it free and inserting a double row of Lembert sutures: these failed to hold and the condition was as bad as ever. Two weeks later he did a more radical operation, dissecting out the fistula and putting in three rows of Lembert sutures. These evidently puckered the intestine too much, as their insertion was followed by pain, vomiting and distention, and no movement of the bowels. Two days later he punctured the intestine in the wound and after two weeks he did a final operation, opening the right rectus above the cæcostomy opening and anastomosing the small intestine (just proximal to where it entered into the mass of adhesions in the right iliac fossa) to the transverse colon by means of a Murphy button placed in the sides of the two coils. To insure union a continuous silk suture was inserted around the button. No drainage. Following this there were no further unfavorable symptoms, and the fistula permanently closed at once. The case illustrates the value of an artificial anus in presence of paralysis of the bowel from sepsis, and also the difficulty which may be met with in closing it. Probably in the majority of cases the anus will close of itself.

#### PYLOROPLASTY FOR PERFORATING DUODENAL ULCER.

DR. A. V. S. LAMBERT presented a man, thirty-five years old, a letter carrier, who gave a history of stomach trouble dating back for five years, and characterized chiefly by epigastric pain and distress and eructations of gas coming on an hour or two after eating. Four hours before his admission to the Presbyterian Hospital he had a severe, sharp, lancinating pain in the epigastrium while he was making his rounds delivering mail. He had taken no food for several hours previous.

full of bile. The head of the pancreas was quite hard; there was no stone. There was no difficulty in examining the pancreas, the ducts or the duodenum; and the patient was made quite comfortable by drainage. The gall-bladder was red and inflamed but there was no pus, just bile, which was seeping from the gall-bladder wall.

DR. ASTLEY P. C. ASHHURST called attention to the question of biliary peritonitis without perforation of the bile-ducts, and referred to the cases reported in 1906 to this Academy, in which was found bile-stained peritoneal effusion without any apparent cause. In one case the appendix was removed and the patient got well; in another simple drainage was employed and the patient died. In the first case the yellow color of the effusion was shown on examination not to be due to bile, but to "disorganization of the coloring matter of the blood." Recently he had seen an article on biliary peritonitis without perforation of the bile-tract, putting on record several cases in which operation was done. In one case, just as in the case which Dr. Gibbon has mentioned, the bile could be seen oozing through the walls of the gall-bladder even after they had been wiped dry. In none of these cases was the fluid examined to see whether it was really bile, but it may be presumed that it was in Dr. Gibbon's case, and in the similar case where it was seen oozing through the walls of the gall-bladder. In the case reported by Clairmont and Haberer (*Mitth. a. d. Grenz. d. Med. u. Chir.*, 1910, xxii, 154) the common duct was obstructed by stone, but the gall-bladder appeared healthy. These observers made a number of experiments on dogs for another purpose, but involving obstruction of the choledochus, and found in a small proportion of cases, in 3 cases out of a large number of experiments, that peritonitis occurred with bile-stained effusion, but without perforation of the bile-tract. Other cases encountered at operation have been reported by Schievelbein, by Johansson, and by Wolff. It has been suggested by Schievelbein that this filtration of bile may be due to the presence in the gall-bladder of structures known as "Luschka's Gänge." These are mucous canals extending to the subserous tissue of the gall-bladder, and are said to exist only in about 3 per cent. of cases. Schievelbein claims that inflammatory changes in the gall-bladder wall destroy its permeability. It is, therefore, only when the unusual coincidence arises (1) that

was then readily passed through the cardia which was dilated, but without resulting benefit. This failure to give the patient relief from dilatation was believed to be due to the course of the œsophagus, lying as it did on the surface of the diaphragm, and the point of its entrance through the diaphragm being situated above the lowest part of the pouch.

On February 1, 1913, an œsophago-gastrostomy was done. An L-shaped incision was made in the median line, with extension to the tip of the tenth rib. Through an incision over the seventh rib beneath the breast the seventh, eighth and ninth ribs were fractured, and a flap turned backward and upward. The left broad ligament of the liver was divided, and the gastrostomy opening separated from the anterior abdominal wall. The stomach and spleen were then dragged downward which gave a ready access to the cardia. The diaphragm was divided to the left of the œsophagus; the left pleura, which was accidentally nicked at this point, was closed by suture. The œsophagus was then loosened from its attachments to the pericardium, diaphragm and aorta, and the findings of the X-ray examination confirmed by palpation. A stiff bougie was then passed down the œsophagus and impinged against the diaphragm, well to the right and posterior to the point where the œsophagus passed through the diaphragm. The portion of the œsophagus situated below the lower end of the bougie was then pulled into the abdomen, and the diaphragm was sutured to the œsophagus at the point where the bougie was intercepted. A large clamp was then passed into the stomach through the gastrostomy opening; one blade of this was passed into the œsophagus through the cardiac opening while the other blade remained in the stomach in such a manner that, when the clamp was closed, there was included between its two blades a portion of œsophagus and a portion of the greater curvature of the stomach or cardia. A few interrupted sutures approximated the œsophagus and stomach about the closed clamp. A rubber tube drain was inserted alongside of the anastomosis. The gastrostomy opening was brought to the abdominal wall and the clamp was left *in situ*.

During the first ten days of the patient's convalescence she had a left-sided pleurisy. The clamp was tightened on the fourth day, and removed on the eighth day. The patient was given liquid food by the mouth for 28 days, when the tube was left

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## ORIGINAL MEMOIRS

### THE TREATMENT OF TUBERCULOUS CERVICAL LYMPHADENITIS.\*

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THE following remarks are based on a fairly comprehensive study of the literature of the last ten years and upon an analysis of the cases of tuberculous lymphadenitis admitted for operation to the service of Dr. C. H. Frazier in the University Hospital during the past twelve years (to January 1, 1913). They were operated upon mostly by Dr. Frazier and by those of us who have been associated with him during that time. Seventy of the cases were admitted during my own connection with the service.

Briefly, there were 103 cases studied; 50 in the male sex; fifty-three in the female. The cervical nodes were affected in 96, the inguinal in 3, the axillary in 3, and both the cervical and axillary in one. The ages ranged from 11 months to 40 years and may be subdivided as follows:

*Cervical Cases* (in infants under two years).—There were only two (2 per cent.) in this group; one, a boy of eleven months had developed a submaxillary mass five months before admission which had broken down and was discharging caseous

\* From the Service of Dr. C. H. Frazier in the University Hospital, Philadelphia. Read before the Academy of Surgery of Philadelphia, April 7, 1913.

and the mediastinum. The cavity produced by the dilated oesophagus always contained very foul-smelling material, and it was thought that if the anastomosis could be made from the abdomen, the clamp would serve its purpose until adhesions had formed. The rather adverse reports that had followed the intrathoracic method in operating on these cases had decided them to go in from below.

#### SACROCOCCYGEAL CYST.

DR. GEORGE WOOLSEY presented an infant, who, when admitted to the hospital, in May, 1912, was nine days old. The mother stated that five months before giving birth to the child she had received a blow over the abdomen, which apparently gave rise to no symptoms. The labor was normal, the child was put to the breast and for the first three days it nursed well and was free from symptoms. Then vomiting set in and became almost constant.

When Dr. Woolsey first saw the child, six or seven days after birth, there was a swelling in the sacrococcygeal region, which pushed the scrotum and anus forward and pressed against the subpubic arch. The swelling was apparently a cyst, and upon aspiration, a clear, yellow fluid was withdrawn. Two days later the legs and lower abdomen became swollen. The cyst was again aspirated and four ounces of fluid withdrawn, but this produced no effect on the swollen parts, which became cyanotic. The vomiting still persisted; the bowels were obturated and the child was unable to void urine.

Operation, May 9, 1912: Upon incising the cyst, several smaller cysts were found to project into it from the deeper surface. The largest of these extended upward into the abdominal cavity between the rectum and sacrum, pressing on the iliac veins. About eight ounces of fluid were withdrawn, and part of the redundant outer wall of the cyst resected. Following this operation, the venous congestion and swelling of the legs and abdomen immediately disappeared, and the child was able to void urine and defecate. The vomiting also ceased. The child's convalescence was practically uneventful, and it was discharged on May 17, 1912. Up to the present time, there had been no recurrence of the cyst. There was some redundancy of the skin over the buttocks, which was much scarred by stitch abscesses. Since the operation, the child had grown remarkably well.

FIG. 1.



Tuberculous cervical adenitis. Tonsils removed nine months previous, mass persisting.  
Location the usual one seen in children.

FIG. 2.



Ideal result fourteen months after operation. Scar scarcely visible. Transverse incision.

ing three pockets of pus and partly freeing the kidney from adhesions, but these were so dense that he was unable to deliver it into the wound. The kidney was thereupon incised, and with some difficulty several phosphatic stones were removed, one the size of a robin's egg, and two of bean size. The abscess seemed to be outside of the kidney, which was very much altered, and reduced to a thick shell. The wound was closed, with drainage.

The patient made a good recovery. The amount of pus in the urine gradually decreased, and under the use of urotropin the reaction of the urine first became neutral and then acid. The wound was closing well and draining considerable urine, and the patient was able to leave for home on August 11, 1911. At the time it was planned to remove the ureteral calculous at some future date, if necessary.

The patient was readmitted to the hospital on February 26, 1912, and two days later Dr. Woolsey exposed the left ureter, which was enlarged to the size of an adult's thumb, with thickened walls. Midway between the pelvic brim and the bladder there was a dark, rough, flattened stone, about one cm. long, which was removed, and two inches below the kidney pelvis two smaller stones were encountered and removed through separate incisions, which were closed by suture. On April 10, 1912, an abscess, about the size of an orange, in the upper pole of the right kidney, was incised and drained.

At the present time (March, 1913), the patient states that she has not felt so well for ten years. Two sinuses persist in the left lumbar scar. One of these, apparently, was kept open by a fragment of rubber tubing which was removed five days ago under local anaesthesia.

This patient, Dr. Woolsey said, was presented again at this time as an example of subjective good health in spite of two greatly damaged kidneys, either one of which would naturally have been removed as useless. The X-ray showed no stones in the kidneys or ureters, for the first time in years.

#### SPLENECTOMY FOR BANTI'S DISEASE.

DR. JOSEPH A. BLAKE presented a woman, forty-five years old, born in Russia, and a housewife by occupation. The history she gave was that three years ago she had a pain in her upper left abdomen. This was sudden in onset and sharp, lancinating

*Cases in Children* (two to seventeen years, inclusive).—In our series there were 49 cases in this group, 50 per cent. of the entire number. This corresponds to the figures of Fischer (46 per cent.) and is far below that of Dowd who observed that 80 per cent. of his cases were in this age group. All of the patients recovered from the operation and of 37 traced, the following was obtained: In 32 there was no recurrence; 2 had died; and 3 had suffered a recurrence.

One patient, a male, age three, was admitted August 19, 1901. The history is meagre, there was a tuberculous family history and several glands were removed from the neck, the wound being drained. A note on the history states that the child died in December, four months later, but I have not been able to verify it.

The second patient was a girl, seventeen years old, who for 18 months before admission had been developing a mass on the right side of the neck. When examined, April 7, 1904, she presented a mass extending from the mastoid to the clavicle. Many of the nodes were discrete and hard. The right lung was also involved. The neck was dissected out and on May 19, 1904, she returned and was operated on for a mass in the axilla. Death occurred November 28, 1904, from pulmonary tuberculosis.

Of the three recurrences, two were in young colored girls, six and eleven respectively, who had extensive bilateral masses in the neck. Both sides were dissected out but in both cases recurrence occurred and one of them is now in the Philadelphia Hospital with bone involvement; the other is living, six years after operation and with recurrence but I cannot ascertain the exact whereabouts. The third case was operated on in October, 1912, and has a slight recurrence. He has had careful X-ray treatment since operation by Dr. Pancoast.

NOTE.—Since this paper was read this boy was operated upon on April 28, 1913, by Dr. Frazier and a few nodes and some tuberculous granulation tissue were dissected out.

Thirty of the thirty-two cases free from recurrence have been heard from during a period of 1 to 11 years since operation, nineteen up to 5 years and eleven over five years; three cases operated on within a year are free from recurrence.

vascular adhesions. There were numerous tortuous veins in the splenic pedicle. No thrombo-arteritis was made out. The hemorrhage during the operation was severe.

On the day following the operation the blood showed 2,450,000 red blood cells, 24,000 leucocytes, 79 per cent. of polynuclears and 50 per cent. of haemoglobin. The temperature, which had gone up to 103°, gradually fell to 100°. There was considerable pink oozing through the stab-wound drain. The pulse ranged between 115 and 130. The patient's convalescence was slow, but gradual, and on the 35th day after the operation a blood count showed 3,200,000 red blood cells, 16,000 leucocytes, 74 per cent. of polynuclears and 65 per cent. of haemoglobin. Her general condition was improved, and there was less abdominal pain each day. She was able to take a little exercise and expected to go to the country.

The spleen, when removed, measured 21 x 18 x 8 cm. Its contour was preserved, its surface being covered in places by organized adhesions. Microscopically, its capsule was found to be thickened, there was an increase in the connective tissue framework, with a marked decrease in the Malpighian bodies. The splenic pulp showed a marked increase in connective tissue reticulum caused by the flushing out of the spleen after its removal. The sinuses appeared empty. There were no evidences of multinuclear cells or epithelioid cells. Section through the splenic artery showed definite thickening of the media; the vein was normal. Diagnosis: Splenic anaemia; perisplenitis.

states that two years later a recurrence occurred which was cured after three years of X-ray treatment.

Dowd (*Surg., Gyn. and Obs.*, 1912, vol. xiv, p. 353) states that adults present a different type of lymphatic tuberculosis. "The infected lymph nodes, instead of caseating in the upper part of the neck before the lower part is involved, are apt to extend throughout the entire side of the neck so that the lower nodes become enlarged almost as much as the upper ones." He had one death in the series, apparently from pulmonary embolus.

In our cases the results may be summarized as follows:

	Cases	Traced	Cured	Recurred	Death (remote)
Infants ...	2	2	2	0	0
Children ..	49	37	32	3	2
Adults ....	46	28	18	6	4
	—	—	—	—	—
Total ...	97	67	52	9	6

In four of the cured cases we performed more than one operation; in that sense they recurred but such recurrences were prompt. In at least one-half of the recurrent cases it seems probable that further operation would bring about a cure.

*Inguinal Adenitis.*—We observed three cases, all in males, nineteen, twenty-five and thirty-seven years old respectively. They all recovered from operation but their subsequent history cannot be learned. In one case the affection followed a "bubo," in another a scratch on the thigh had existed for three weeks previously, and in the third no cause could be ascertained.

*Axillary Adenitis.*—There were four cases in this series, one of which, a boy of eight, had a coincident cervical adenitis. One patient, a male, age thirty-three, ascribed the swelling to a fall on the shoulder; another, a female, age eleven, stated that it developed two months after recovery from typhoid fever; and the fourth, a female, age thirty-two, had a thecitis 19 months previously, although the axillary swelling did not appear for 18 months thereafter. All recovered from opera-

collection, large or small, usually on the right side, are sometimes the only symptoms present. In one young child under his care rapid emaciation was a striking symptom. In some cases physical signs suggesting subphrenic abscess are apparently present and no abscess exists. A few weeks ago there was such a case at the Presbyterian Hospital which was studied very carefully by both the medical and surgical men and also by the radiographer. All signs pointed to a pleural effusion. The patient had had perforative appendicitis followed by high fever, and all agreed upon a probable diagnosis of subphrenic abscess. Aspiration and subsequent abdominal exploration were both negative and proved this diagnosis to be wrong.

In another case in which the patient was demonstrated at operation to have a large collection of pus in the subphrenic region an X-ray was taken before the operation, and the radiographer denied the possibility of a subphrenic collection, but after operation, acknowledged that he had failed to read his plate correctly. We must, therefore, acknowledge that X-ray pictures in this condition require very careful study and expert interpretation, and even then, may be deceptive; but they should be taken in all suspected cases, as they will in time undoubtedly furnish us valuable information as to the presence of such collections.

DR. GEORGE G. ROSS said that it had been his experience that subdiaphragmatic abscess is due more often to inflammations of the vermiciform appendix. He remembered one case due to perforative gastric ulcer which was of the anterior subdiaphragmatic variety. He thought the appendix gives rise more often to infection of the subhepatic space, but when it occupies a position behind the cæcum the direct line of infection is toward the subdiaphragmatic space, largely on account of the arrangement of the psoas-iliacus muscle which gives a distinct upward flow to the infection when the patient is recumbent. His attention was called to this subject by an occurrence at the German Hospital in which in one week there were four cases of subdiaphragmatic abscess in patients operated on for appendicitis.

DR. ASTLEY P. C. ASHHURST said that he had gone carefully over the case reports, and found that only an exceedingly small number were what should be called true subphrenic abscesses; the vast majority were what are properly described as subhepatic abscesses or abscesses of the kidney pouch. The incision

The constant presence of enlarged lymph nodes in the majority of children is not so well known that the following figures from the older literature need not be repeated. Thus, Colland (*Zeitschr. f. klin. Med.*, 1893, xxiii, p. 50, and *Munch. Med. Woch.*, 1904, li, 87), in an examination of 2506 persons between the ages of 7 and 24 years, found that 94 per cent. of those between 7 and 12 years had enlarged cervical nodes. Laser (*Deutsche. Med. Woch.*, 1896, xxii, p. 500) examined 1216 school children, 1079 (89 per cent.) of whom had enlarged cervical nodes. He came to the conclusion that in 32.4-58.9 per cent. of the cases tuberculous nodes were present. In the report of the Division of Child Hygiene of the Boston Board of Health for 1911-1912 the physical examination of 118,781 school children revealed 13,711 cases of enlarged cervical glands. From these statistics, and there are numerous others, it may be concluded that swelling of the cervical nodes is very frequent and in a large number of cases that this swelling is of tuberculous origin. Now, no one supposes that all of these children develop a persistent clinical mass, probably not 2 per cent. of the Boston cases came to operation. The vast majority subside as they clear themselves of the infection. Herein lies the success of the tuberculin, hygiene and perhaps of the X-ray treatment.

Another point of practical importance has been brought out by Wright (*Brit. Med. and Surg. Jour.*, 1913, clxviii, p. 232). He states that the tonsils may become enlarged without infection or disease whenever (a) the first group of temporary molars at two years of age are in process of eruption; (b) at six years, when the first permanent molars, and at 12 years, when the second molars are active in eruption. The teeth may be diseased at these periods and be a source of infection, and enlargement of the tonsils and glands.

*Pathology.*—From the lymph vessel the organisms pass to a node, are arrested or destroyed there or else pass through to the next one and so on. If the resistance of the first node or nodes is sufficient there is interposed an effectual barrier, even if the node is destroyed. This is especially the case in

until the intact pleural cavity is in this way isolated from the operative field are the deep layer of the periosteum, the contiguous layers of the pleura and the diaphragm incised. In this way the chance of infecting the pleura is very remote.

DR. DESPARD remarked, in closing the discussion, that the belief that subdiaphragmatic abscesses are more usually due to the appendix, is true if only applicable to the subhepatic fossæ, but if all the subdiaphragmatic areas are considered statistics will show that perforating ulcers of the stomach or duodenum are the most frequent cause. The subhepatic fossa is the site of an abscess truly subdiaphragmatic for it rests upon the right crus of the diaphragm and is limited above by the right lateral ligament of the diaphragm.

In regard to the case spoken of as not having been drained, the evidence of infection in this region at the time was not sufficient to justify drainage. At the autopsy this abscess was found to be both intra- and extraperitoneal, involving the upper pole of the right kidney and the under surface of the liver. It was probably imperfectly drained through the anterior wound, so that the pus did not accumulate in sufficient quantities to give such definite physical signs as would justify exploration.

How this extended to the point above the kidney is uncertain, but probably by means of the retroperitoneal lymphatics. He suggested this differential point, lumbar or postcæcal abscesses are entirely different from subdiaphragmatic abscesses and are often due to imperfectly drained appendiceal infections; none of his cases were of this variety or in this situation.

#### TUMORS OF THE CAROTID BODY.

DR. JOHN CHALMERS DACOSTA presented a specimen of a carotid tumor which he removed several months ago. The patient was a woman of thirty-six years of age. The growth began 16 years ago, was very slow for many years but during the last 6 months it has grown more than it did in the previous 15½ years. The tumor is about the size of an English walnut. The diagnosis was made in this case before operation. The very slow growth for years, the carotid pulsation which lifted the tumor at every beat of the artery, the absence of expansile pulsation, the free movement from side to side, the absence of mobility

vical situated along the posterior edge of the sternomastoid muscle and a deep cervical along the course of the vessels. More extensive classification will be found in the text-books on anatomy. The terminal collecting trunk of the cervical lymphatics on the right side usually empties directly into the venous junction, occasionally as a common trunk with the subclavian lymph vessels and only rarely these two and the bronchomediastinal trunk are in junction. On the left side the jugular trunk usually empties into the terminal bend of the thoracic duct and rarely is associated with the other trunks.

*Treatment.*—I do not wish to be understood in this paper as making any plea for operative treatment as opposed to the use of hygiene, tuberculin or the X-ray, but I do hope to be able to present to you certain arguments showing the need of radical surgery at the right time and in the right manner. Following the dictum of the tuberculin and X-ray enthusiasts, many writers decry the use of surgery until softening has occurred at which time incision and drainage is practised or else the cavity is aspirated and filled with iodoform, formalin and glycerin. The arguments against operative treatment may be said to be grouped into two classes: First, by those who believe that recurrence, disfiguring scars, paralysis following nerve injuries, or contractures from muscle injury are of frequent occurrence; and second, by those who believe in the tolerance which the individual, especially the child, may have to certain forms of tuberculosis and the stimulation of an immunity by the tuberculous focus especially when activated by tuberculin. In addition, series of reports of cases cured or improved by tuberculin or by X-ray are often quite encouraging and the natural dread of submitting children "to the knife" popularizes these methods of treatment.

We can dismiss the mortality of operation in a few words. The extremely low mortality is surprising when the difficult nature of some of the operations is considered. We did not lose any of our patients during a period of twelve years. Judd (*ANNALS OF SURGERY*, 1910, vol. lii, p. 758) states

## LACTEAL CYST OF BREAST.

DR. DA COSTA presented a specimen being a huge milk cyst of the breast. He said that it was the second one he had ever seen. The previous one, which was much smaller, was in the service of Professor Keen. This growth did not start during pregnancy nor lactation, at least if it did the woman never noticed it, but it began six years after a child birth. It grew slowly, was free from pain, troubled her only from its weight, and felt soft, as though it ought to fluctuate, but there was no fluctuation. As one pressed upon it it suggested thick walls with fluid beyond them. There were many large veins in the skin of the breast. There was no discharge from the nipple and there never had been.

On opening into this it was found that the entire breast was converted into a grayish yellow mass of the consistency of butter. Macroscopically there was no breast tissue remaining. Therefore, he removed the gland. Chemical tests showed that it contained products from milk and a study of it proved it to be a typical galactocele, the breast being practically completely destroyed.

## ACUTE SPONTANEOUS PERFORATION OF THE GALL-BLADDER INTO THE FREE PERITONEAL CAVITY

DR. GEORGE G. ROSS reported the history of a case of perforation of the gall-bladder into the free peritoneal cavity due to ulceration of the gall-bladder walls, as follows: Woman, age sixty-three years. In childhood had measles. At thirty-three years of age had catarrh of the bowels, during and immediately following which she had malaria which lasted one year. During malarial influence she had a chill every other day but did not go to bed. About this time (33rd year) she had indigestion so bad that she ate only "starch" and "camphor," eating about a pound of washing starch daily and now and then camphor.

In April, 1912, she was suddenly seized with a severe pain in the epigastrium which lasted about one day leaving her tender and sore for one week afterwards. On May 13, 1912, there was another attack of very severe and excruciating pain in the lower abdomen. Three days prior to May 13 she had complained of marked abdominal soreness, but the sudden pain

and aseptically re-opened every other day with a grooved director and the serum and lymph evacuated. Care must be taken that the throat wounds are kept clean if the tonsils and adenoids are cleaned out at the same time as the adenectomy, otherwise infection of the wound is bound to occur. Care must also be taken of the pocket under the parotid if that organ is cut, usually by sewing the gland down and by the administration of urotropin. In a few cases a severe lymphœdema has occurred, most annoying at the time and usually provocative of delay in healing. Of course, in the advanced cases with a radical dissection, some scarring is to be expected; one might just as well argue against the performance of operation for appendicitis because of the occurrence of incisional hernia, which may easily result in neglected cases when extensive drainage has been used.

As to the second point, the nerves that may be injured during the operation are the pneumogastric, facial, hypoglossal, spinal accessory, and certain of the superficial branches of the cervical plexus, especially the fifth cervical. The vagus is so deeply placed and so easily isolated that its injury is almost inexcusable. The facial trunk is also deep and even in the parotid involvement should not be touched; certain cervical fibres of the facial nerve which supply the depressor muscles of the lip are often cut, torn or crushed with a resulting slight, but deforming droop of the lower lip on that side. The nerve clings tightly to the under surface of the superficial layer of the deep fascia and if the incision is placed one-half inch below the jaw and deepened so as to carry the fascia up with the skin and muscle the nerve can almost invariably be avoided. In one of our cases I cut the hypoglossal nerve and in spite of suture a hemiatrophy of the tongue resulted. The case was advanced and very difficult but there was hardly any excuse if I had properly located the nerve. The spinal accessory is the nerve most frequently divided with permanent asymmetry of the shoulders and a scoliosis in about one-third of the cases. For this reason it should be carefully searched for and preserved. When the anterior deep

It is quite evident that the organism found in the gall-bladder and peritoneal cavity were of a low state of virulence as the peritonitis was of a distinctly low grade, there being little or no lymph deposit and the cloudy, bile-stained fluid found in the pelvic cavity was not true pus.

Patient made an uneventful recovery, going home with a small fistulous tract to the gall-bladder.

Since preparing the report of the above case a second case was admitted to the Germantown Hospital, which Dr. Ross saw in consultation with Dr. Wm. N. Johnson to whose ward the patient was admitted.

The patient was a man, forty-seven years of age who three days before admission was seized with pain in the lower right side of the chest. This pain was made worse by a cough, which was dry, and unproductive, or by deep inspiration. For five days before this severe pain in side, patient had been coming to the medical dispensary complaining of a feeling of weakness—general vague pains, headaches, constipation, loss of appetite and restlessness at nights. Gives no history of nausea, vomiting or chills.

When admitted the abdominal wall was rigid. The distention was marked. The abdomen was so tender that palpation was painful (the weight of an ice water bag causes pain to be increased). Lower liver margin could not be felt. At a point over the gall-bladder area the tenderness was more pronounced.

The patient died the second day after being in the ward. The following are the notes taken from the autopsy report:

"Lungs, heart and pleura normal; abdominal cavity contains a large quantity of free, greenish pus; intestines distended, highly inflamed and covered with exudate; omentum matted together in the region of the pylorus and gall-bladder; gall-bladder contains a few ounces of pus; a large gall-stone found in the cystic duct; perforation (ulcerated through) in cystic duct through which pass bile and pus; dome of the liver up as high as the third rib; pancreas, spleen, kidneys and appendix normal."

DR. JOHN H. GIBBON asked what are the causes of rupture of the gall-bladder outside of ulceration from stone and traumatism. He had had such a case and had no idea what caused it; he expected to find a stone but on opening the abdomen there was a lot of free bile in the peritoneal cavity and the gall-bladder was

operating on three or four of the nine recurrences. Dowd, in his address before the Congress of Surgeons meeting in Philadelphia in 1911, stated that from his experience "we may fairly expect freedom from recurrences in 75 per cent. and permanent recovery in 90 per cent. of the cases." In Judd's collection of 649 cases there were 8.6 per cent. of recurrences in the region of the former operation. I am almost tempted to say that with proper technic, recurrence is impossible,—we have simply failed to entirely remove the infected nodes. Stone (*Boston Med. and Surg. Jour.*, 1912, vol. clxvii, p. 537) believes that the recurrence after radical excision is due to the failure to recognize and remove the primary foci of infection or the vulnerable points of entrance.

*The Indications for Operation.*—It is not easy to indicate clearly those cases which require operation and those which should be treated by other means. Judd outlines the following method of treatment:

Clear the throat of the adenoid tissue and tonsils, attend to the teeth and nose, administer tonics, especially the syrup of ferrous iodide, and advise out-door living. He believes that many of the cases in the hyperplastic stage or as Bennett would say, during the period of bacillary invasion, are cured by these measures. After caseation occurs, Judd removes the infected nodes, and drains the wound. If in spite of treatment, the nodes continue to enlarge and other nodes become involved, he performs a complete excision; in the presence of a discharging sinus he curettes the softened mass, swabs the wound with equal parts of tincture of iodine and carbolic acid and when the sinus heals, a radical operation is done if necessary. Stone is much more radical in his advice, he asks, "What can be gained by delay? The possibility of arrest, or if a mistake in diagnosis has been made, of cure; the probability of caseation of the entire gland to spread into the surmounting tissue, with the necessity of surgical interference under most un-satisfactory conditions, or the tedious natural discharge through a chronic sinus."

He does not minimize the value of hygienic treatment or the value of resistance, but emphasizes the fact that enucleation of a tuberculous focus does not cure the disease which remains as a

these canals are present; (2) that acute obstruction occurs in the presence of a nearly normal gall-bladder, that biliary peritonitis can occur without perforation of the bile-tract. This theory, however, fails to explain cases like those reported by Dr. Davis, where the fluid was shown not to be bile, but altered blood.

While the post-mortem discoloration of neighboring parts by the bile is well recognized, it does not facilitate the explanation of such a change during life.

DR. GWILYM G. DAVIS said that the cases reported by him some years ago in the ANNALS OF SURGERY were carefully studied and the liquid was examined; the coloring matter was found to be hemoglobin.

DR. JOHN H. JORSON said that he had operated on two cases of perforation of the gall-bladder into the general peritoneal cavity. One of these which was reported before the Academy of Surgery in 1904 was in a woman of fifty-one, sick for 48 hours with gall-stone colic, but the perforation was probably not over 6 or 8 hours duration. There was a single stone in the first portion of the cystic duct, and the site of perforation, while not determined exactly, was near the cystic duct. This patient recovered.

In the second case which was in an elderly woman the perforation was of much longer duration, probably 36 hours or longer; the patient came to operation in bad shape suffering from sepsis and exhaustion and afterward succumbed.

#### THE RELATIONSHIP BETWEEN GASTRIC AND PANCREATIC CARCINOMA.

DR. EDWARD A. SCHUMANN read a paper with the above title for which see page 326.

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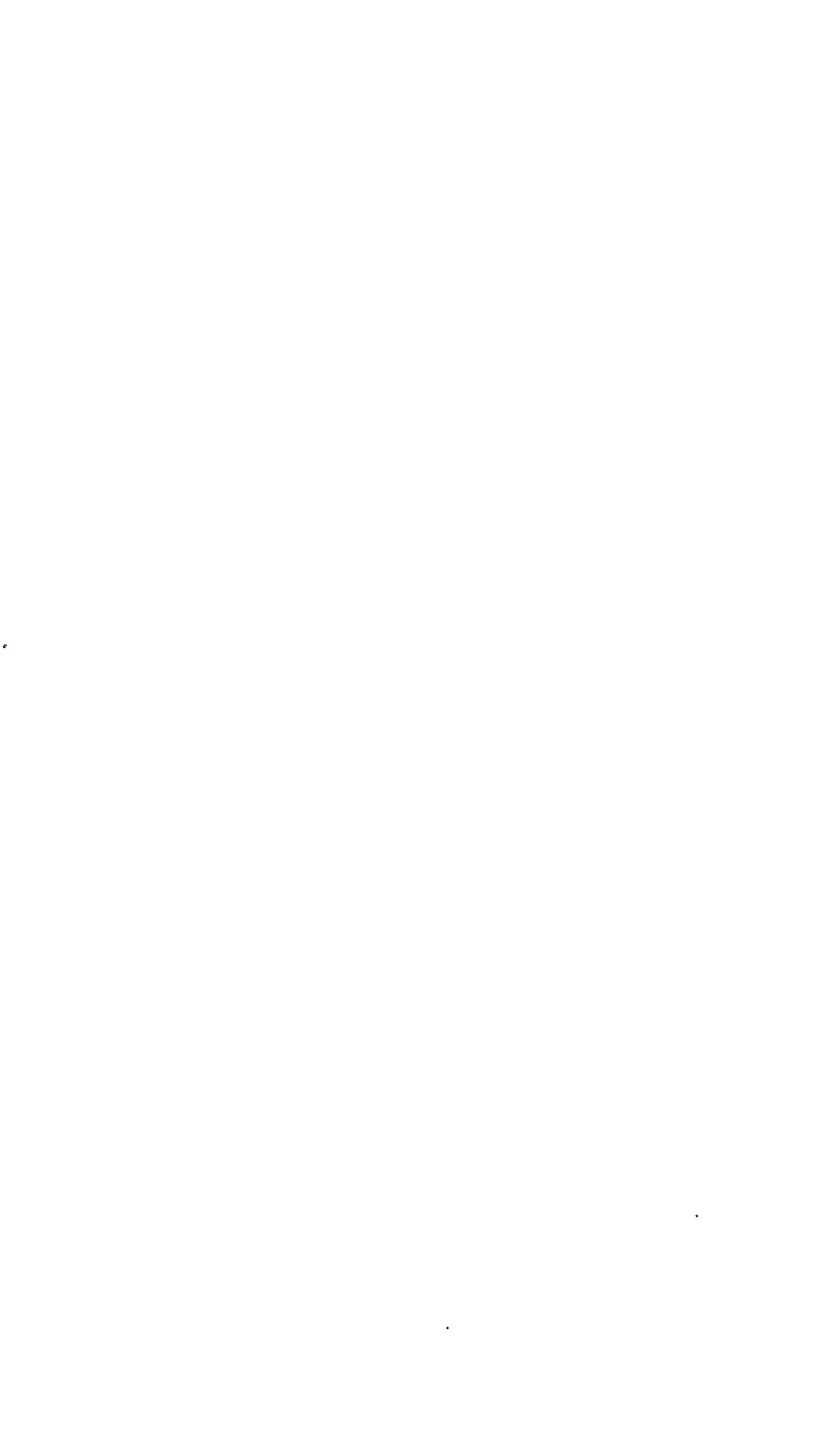
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material through a sinus. There was no evidence of a portal of entry but an older brother had experienced the same affection. The mass was dissected out. The child recovered but returned to the hospital 17 months later with a tuberculous dactylitis which was curetted. In September, 1908, three years after the original operation, 19 months after the second, there was no evidence of either trouble. He has since been lost sight of. The other patient, a girl of sixteen months, developed acutely, seven months previously, a high anterior cervical swelling, which presented on admission a fluctuating mass. It was incised and partly dissected out. The tonsil seemed to be the portal of entry and one uncle had died of tuberculosis. Two years and nine months later the child was reported as being free from recurrence.

Approximately 3 per cent. of the 465 cases recently reported by Dowd were below the age of two years and he believes that this group shows less power of resisting tuberculosis than the other groups. One of his cases also developed a spina ventosa. Two of the fifteen died within six months of their operations but the ultimate results of the others were quite good. Some interesting facts are brought out by Harbitz (*Jour. Infect. Diseases*, 1905, vol. ii, p. 143) in regard to postnatal tuberculosis and he quotes cases where death has occurred as early as the eighth week. The source of infection in our cases could not be determined but must have been from milk or the dust of the floor. La Fetra (*Archives of Pediatrics*, 1907, xxiv, p. 418) has reported a case of tuberculous lymphadenitis in an infant of four months in which there was no evidence whatever pointing to the source of the tuberculous infection except the contraction of several colds and the fact that the father had a cold in the head at the time of the infant's birth. The child was fed on milk from a model farm and there was no sign of family tuberculosis. It was believed probable that the first cold was taken from the father or from the street dust and that later, perhaps through the inflamed tonsil or nasopharynx, the tubercle bacilli penetrated to the lymph streams leading to the deep cervical nodes.



*Cases in Adults* (over 17 years of age).—There were forty-six in this group. These patients also recovered without exception from the operation and of 28 traced, 18 were free from recurrence, 4 had died, and 6 suffered from a recurrence.

The cases free from recurrence, with two recent exceptions, were heard from at periods varying from 1 to 12 years since operation. In seven cases over 5 years have elapsed.

Of the deaths, one, a man of thirty-three, was operated on in October, 1903, four years from the beginning of the affection during which time he had 3 operations elsewhere. There was spinal caries in addition; he died eighteen months after our operation. The second, a woman of twenty-six, was operated on in April, 1903. She had extensive involvement of both sides and they were dissected out in two sittings. She died two years later from pulmonary tuberculosis. The third death occurred in a man of twenty who was admitted during February, 1910, with a mass reaching from the ear to the clavicle. He died of pulmonary tuberculosis in March, 1912, but there was no recurrence in the neck and the letter states that the scar was scarcely visible. The fourth death, a man of twenty-six, was admitted in March, 1911, with a mass extending from the ear to the clavicle, and a mass in the groin and a pulmonary lesion. The cervical mass was of three years duration. He died six months after operation.

As to the five recurrences, Case I, male, age twenty-four, has a note on his history that he was re-operated on in 1911, eleven years after the original operation. There are no other data. Case II, female, age twenty-one, operated on in June, 1909, for a large mass of two years' duration, states that she has recurrence but has had no second operation. Case III, female, age twenty-one, with a small submaxillary mass in both sides operated on in May, 1910, in a curt note simply states that she has had a recurrence. Case IV, male, age forty, also had a small submaxillary mass, operated on in April, 1911, probably has a recurrence but he is quite illiterate. Case V, male, age twenty-three, operated on in June, 1911, for a large mass in the neck, states that he has a soft swelling under the scar. Case VI, female, age 21, was operated on in May, 1904. She

tion, the first two cannot be traced, the third was free from recurrence one year later and the fourth died of pulmonary tuberculosis five years after operation. From the subsequent history we learned that she had had a spinal caries in the interval, apparently cured by the wearing of a brace.

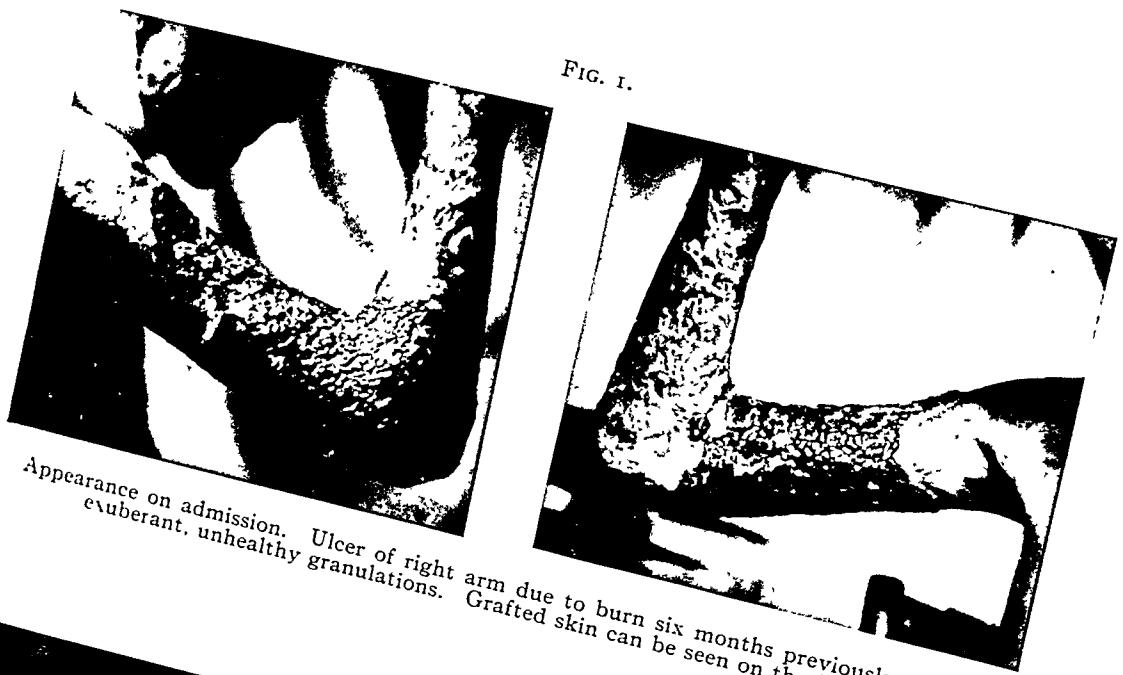
*Etiology.*—It is generally admitted that cervical tuberculous lymphadenitis represents the local deposit and proliferation of the tubercle bacillus from some lymph vessel draining a particular portal of entry. The faucial tonsils are generally considered the most frequent of these portals, followed in order of importance by the pharyngeal tonsils or adenoids, middle ear disease, carious teeth, lesions of the buccal and nasal mucous membranes and various miscellaneous causes—cracks and fissures and skin diseases, etc. The consumption of tuberculous butter or milk, the childish habit of sucking the fingers, pencils and other objects picked up from the floor, the influence of flies that deposit the bacilli on food, etc., especially in a household where some other member of the family has or has had tuberculosis or where some tuberculous person previously has lived in the house, all favor the deposition of the organisms at the portal of entry. It would be of no practical importance to enter into the controversy as to the exact percentage of tuberculous tonsils that are present in tuberculous adenitis nor to discuss whether the tubercle bacillus can pass through the tonsil into the lymph stream leaving no trace of its passage. Harbitz has isolated the tubercle bacillus from cervical lymph nodes showing no visible macroscopic or microscopic evidence of tubercle, latent infection, he terms it. That such can occur seems undoubtedly to be true and when we consider the rather widespread downward sweep of tuberculous cervical lymphadenitis in the adult and have knowledge of the termination of the lymph vessels in the blood stream we can readily perceive the danger to the individual of a tuberculously infected portal of entry or a progressive involvement of the nodes. They do not act as filters, merely as a very important part of the defensive mechanism.

the child where the lymphatic tissue has great activity and explains the tendency of this disease to remain localized in children, to the upper part of the neck in the region of the first group of nodes invaded by the infecting agent. Dowd (*Surg., Gynec. and Obst.*, 1912, xiv, p. 353) remarks that 80 per cent. of his cases occurred between the ages of 2 and 17 and almost constantly this group is regular in its clinical picture; viz.: a localized mass below the parotid and either in front or behind the sternomastoid muscle. It is well that this is so when we turn our attention to the lymph paths.

Roughly, the tonsils and pharyngeal region empty into nodes that lie a little below and behind the angle of the jaw, and immediately in front of or under the anterior edge of the middle of the sternomastoid muscle. The lymphatics in front of, and above, the auditory canal lead to the preauricular nodes, and they become enlarged from any infection of the forehead, an eczema or intertrigo in the crease between the scalp and ear, a furunculosis of the anterior wall of the auditory canal, etc.; usually the infection is pyogenic, occasionally tuberculous. The central portion of the face, roughly from above the outer corner of the mouth, and from below the outer corner of the eye, drains into nodes situated about the facial artery and vein in front of the angle of the jaw; fissures and sores about the nostrils, and about the corner of the mouth and eye, and irritations within the nose may cause their enlargement. The lymphatic vessels from the lower lip and chin drain into the submaxillary or submental nodes. The scalp drains into a group beneath the occiput, and the middle ear, mastoid, and overlying tissues drain into a group under the mastoid. Infections of the gums or bone about the roots of the teeth pass from the upper jaw to the nodes at the angle of the lower jaw and from the lower jaw directly into the submaxillary nodes.

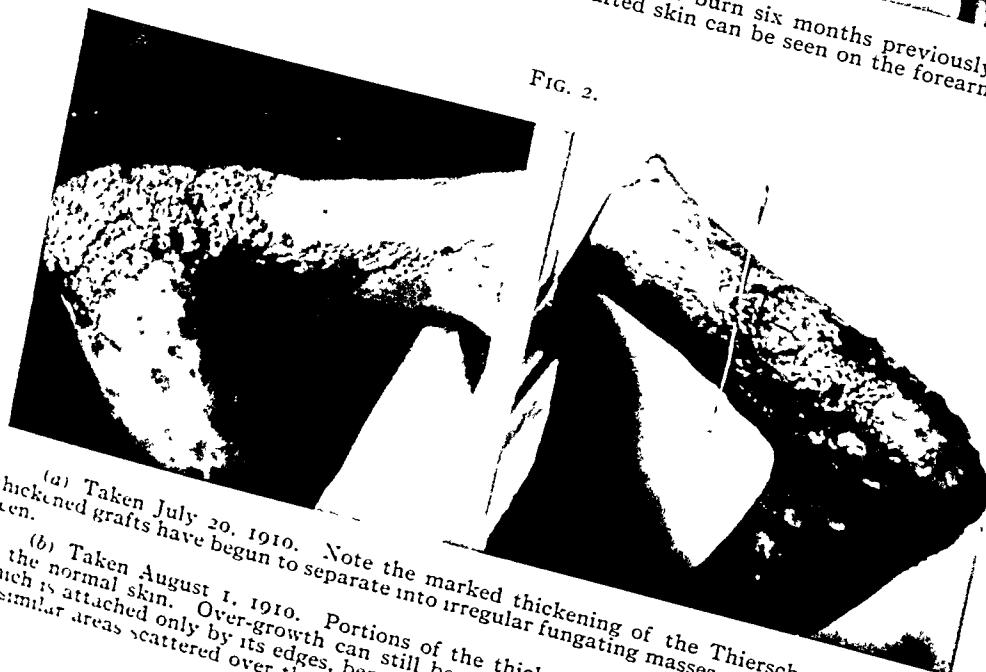
These nodes may be classed anatomically as a superficial parotid and a superficial submaxillary, the latter being so intimately associated with the deep submaxillary under the fascia as to be indistinguishable clinically; a superficial cer-

FIG. 1.



Appearance on admission. Ulcer of right arm due to burn six months previously. Note exuberant, unhealthy granulations. Grafted skin can be seen on the forearm.

FIG. 2.



(a) Taken July 20, 1910. Note the marked thickening of the Thiersch grafts. The thickened grafts have begun to separate into irregular fungating masses which can be plainly seen.

(b) Taken August 1, 1910. Portions of the thickened grafts have assumed the level of the normal skin. Over-growth can still be seen in other areas. Note the overgrowth which is attached only by its edges, beneath which a probe is passed. There are a number of similar areas scattered over the arm.

that 649 patients have been operated on in the Mayo clinic without any operative mortality although one patient died a few weeks after operation of general tuberculosis and a second died in about three months from diffuse sepsis. The older statistics of Jordan, Wohlgemuth and Blos give similar results. Dowd reports two deaths in 465 cases, one of which, an adult, was found dead in bed, probably from pulmonary embolus. Of the Mayo cases, 19 subsequently died of pulmonary tuberculosis, nine of other tuberculous lesions. Of our series, three subsequently died of pulmonary tuberculosis, one of spinal tuberculosis, and in two the cause is unknown. In the older literature Jordan among others speaks of the favorable influence of operation upon the pulmonary lesion. In one of our cases operated on eight years ago there were signs of involvement of the apices. He is now perfectly well.

The objection of the scar is well founded. No one wants a scar in any visible portion of the body and the neck scar if conspicuous marks the patient as tuberculous. But much of the talk about disfiguring scars is ridiculous. Of 53 of our patients seven complain of unsightly scars. Three of these were advanced, diffused lesions, requiring drainage for the spaces left after the dissection. In one a transverse incision with drainage lasting for some time, while it gave a bad scar, and the fifth was an easy case which healed up by first intention; some error in technic must have been the cause of the scar in this case. With this exception every easy case has a small neat scar and in twelve cases the patients declare it can hardly be seen. We are now particularly careful to sew the platysma and fascia with plain catgut and use fine worm gut, horse hair, or the subcuticular stitch for the skin. If drainage is needed we introduce a small piece of rubber tissue through a minute puncture below the scar. In extensive dissections requiring the vertical posterior incision, we drain either through a stab wound or at the lower angle of the long incision. The rubber drainage in most cases is removed in 24 to 48 hours and an attempt made to get a primary union; if necessary the pocket may be carefully

FIG. 4.



Section of small papillomatous overgrowth. For description see text. (Microphotograph by Schapiro, Zeiss. Obj. AA. Oc. 3.)

FIG. 5.



Section of papillomatous overgrowth. For description see text. (Microphotograph by Schapiro, Zeiss. Obj. AA. Oc. 3.)

cervical nodes enlarge they are apt to dip in between the internal jugular vein and the nerve in the inch or so of its course from beneath the posterior belly of the digastric to its point of entrance to the sternomastoid. In old cases the capsule of the nodes is firmly adherent, but the nerve can generally be defined if a sufficient exposure be made by firm retraction of the muscle. In the posterior triangle the nerve crosses the space in a species of groove between the nodes and perhaps runs its greatest risk of being cut where it emerges from the sternomastoid at or slightly above the middle border of this muscle. Jacobson (*Ohio State Med. Jour.*, 1908, vol. iv, p. 9) offers an additional reason why the nerve should be preserved. The muscles of the chest are in a measure auxiliary muscles and are needed especially in pulmonary tuberculosis, and he has observed that patients with slight lung involvement do badly when the spinal accessory nerve is divided. While division of the sensory branches of the cervical plexus seems a matter of small moment, Murphy (*Prac. Med. Series*, 1906, vol. ii, p. 262) calls attention to injury of the fifth cervical nerve which produces paralysis of the rhomboid muscles, permitting the scapula to project backward. He believes it is more serious than division of the spinal accessory. In our records of 56 patients the spinal accessory was surely cut once and possibly in a second case. One patient only complains of a droop at the angle of the mouth, although I know of one other case where I cut the cervicofacial nerve but the deformity disappeared in six months. In one case, as mentioned, the hypoglossal was cut. There is no necessity for the division, removal or injury of any muscular structure unless it is hopelessly involved by the morbid process. We have entirely given up the division of the sternomastoid muscle to get more room. It seems to us, therefore, that this objection is not well founded unless one considers bad operating as a contra-indication to operation.

As to the third point, viz., recurrences, I have given our own statistics with 85 per cent. of cures in the cases traced that are living and this figure would be increased by re-

smouldering fire ready to flare up if the proper conditions of trauma, fresh infection, or decreased resistance arise. I will summarize our own position in a moment.

*Tuberculin Therapy.*—There seems to be no unanimity of opinion among the writers on the treatment of tuberculous lymphadenitis as to the value of tuberculin in treatment. Various writers either support its use with intense enthusiasm or else state that the good results obtained are due to the improved hygiene, fresh air and regulated diet that are instituted coincident with tuberculin treatment.

Allen (*Vaccine Therapy, Its Theory and Practice*, London, 1910) states that "out of eight cases there is an expectation of marked improvement in five, slight improvement in two, and complete failure in one or two." Carmalt Jones (*British Medical Journal*, 1909, vol. ii, p. 531) states that out of 79 cases treated by inoculation "27 were cured, 21 made much better, 18 made better, 8 unaltered, and 4 made worse." Raw (*Lancet*, 1910, vol. i, p. 844) considers that "glands in the neck are the most favorable lesion for treatment with human tuberculin." He treated 62 cases with "very astonishing and excellent results," but the extravagance of this and other statements in his article vitiate the soundness of his observations. Hawes (*Boston Med. and Surg. Journal*, 1912, vol. clxvi, p. 80) after stating that the physician should not depend upon surgery alone, hygiene alone, nor tuberculin alone, believes that of 56 patients treated by improved hygiene, fresh air, out-door sleeping, improved diet, etc., and tuberculin, in 27 the disease was apparently cured or arrested, while in 16 others the condition of the patient was improved. I might continue to quote from various other authors more or less indefinitely but it seems to me that while I would not agree with Hawes in his belief that the so-called radical operation is comparatively rarely indicated, yet I do agree with him "that the broad-minded physician will not claim that surgery alone, hygiene alone or tuberculin alone will cure tuberculous adenitis, but he will use each and all of these three methods of treatment according to the needs of the individual patient."

The action of tuberculin is simply the production of a degree of focal reaction followed by an adequate but not excessive auto-inoculation. In the hands of those skilled in such therapy it may be used as a valuable adjunct to surgical treatment, in unskilled hands it may act as a dangerous boomerang.

tissue was smaller, the epidermis much thicker, and the section seemed to be horizontal through the papillæ rather than vertical. There were also a few cavity formations in the epidermis, filled with hornified epithelium, which had the appearance of the so-called inclusion dermoid cysts. In the connective tissue of this section, there were numerous endothelium-lined canals filled with blood, probably young capillaries, and some more dilated similarly lined spaces filled with blood which may have been veins. There were also some dilated endothelium-lined spaces which suggest lymphatics.

The entire picture, therefore, suggests unusual epithelial activity. That is, the healing process of epidermization was going on very actively; one would naturally conclude, perhaps too actively, or, as Adami would express it, "over-sufficient." The possibility of producing a definite malignant epithelial growth from such stimulation, as has been observed in X-ray and radium keratosis, should be borne in mind. This possibility is illustrated in the character of the epithelial overgrowth into the granulation tissue filling a defect in the epidermis as noted above. Here the cells were not growing as in normal epidermization in which the downgrowth was always composed first of a basal-cell layer, but, instead, the transitional and squamous cells were proliferating irregularly into the granulation tissue, as in carcinoma. But these cells as yet have not assumed the abnormal morphology seen in cancer.

#### REMARKS.

The microphotographs, especially Fig. 5, show a condition which resembles very closely sections of the atypical epithelial proliferations produced by injecting scarlet red oil, subcutaneously, under pressure into a rabbit's ear.<sup>5</sup> These experimental tumors never show a tendency to independent aftergrowth, and persist only as long as the injections are continued and the scarlet red remains in the tissues.

The epithelium of this patient seemed to be particularly responsive to the stimulation of amidoazotoluol, and these thickened grafts present the most remarkable condition of overgrowth which has come under my observation.

<sup>5</sup> F. H. Helmholtz: J. H. H. Bull., Sept., 1907, p. 365, Fig. 2, Exp. Ia.

In the application of the X-ray he arranges the cases in three distinct groups: (1) Cases in which the enlargement has not reached the operative stage. In a large percentage of such cases it is possible to check the progress of the disease by systematic and careful X-ray treatment combined with the essential constitutional measures. But it is not always possible to promote a complete absorption in some of the larger glands even though the disease process is checked because of the inability to remove the excessive degree of hyperplasia. (2) As a post-operative treatment in cases in which the glands have not begun to undergo caseation. Where operation has been limited to the removal of the large nodes, post-operative X-ray treatment may check the disease in the smaller ones. (3) As a post-operative treatment in cases in which caseation or suppuration has begun, especially in cases where sinuses have formed.

The above is an abstract and represents our own opinion and practice in advising the use of the X-ray. I would call attention, however, to the statement by Dr. Pancoast in which he refers to large nodes, etc., which have not begun to undergo caseation. This is a common error noticed in all the articles written by tuberculin and X-ray advocates and by those without operative experience. The simple hyperplastic node is a small one and when a tuberculous node becomes large and visible it will always be found to be caseous. In fact, I do not remember ever having operated upon a case of tuberculous lymphadenitis in which at least one of the nodes was not caseous.

*The Manner of Interference.*—I will not burden you with a detailed description of the technic of operation; we are mostly surgeons and quite familiar with the details. The description by Judd of the operation done with the long posterior incision is most thorough and should be consulted by those unfamiliar with his paper. The papers by Dowd (*ANNALS OF SURGERY*, 1908, xlviii, 169) describe the steps of the operation through the transverse incision. As to whether the dissection of the glands should be done by knife, dissector, scissors, or gauze will depend on the personal experience of the operator. The Mayo scissors are certainly safest and if used with skill almost as rapid in execution as is the knife. Care should be taken to avoid "spilling" the

# EMBOLISM AND THROMBOSIS OF THE SUPERIOR MESENTERIC ARTERY.\*

A REPORT OF ONE CASE.

BY LLOYD NOLAND, M.D.,

Chief of Surgical Clinic, Colon Hospital, Cristobal, Canal Zone.

AND

FRED C. WATSON, M.D.,

Colon Hospital.

THE comparative rarity of this condition, the difficulty, if not impossibility, of diagnosis before operation, and the extremely high mortality are deemed sufficient reasons for the presentation of this paper.

**CASE REPORT.**—Case No. 28888, W.N.R. Jamaican, male, black, age fifty-eight, blacksmith; on Isthmus 30 years; admitted to Colon Hospital December 20, 1910, at 12.40 P.M.

**Past History.**—Patient has had a right inguinal hernia for two years and at times has had considerable difficulty in reducing it.

**Present Illness.**—Two days before admission a large mass descended into the right side of the scrotum. Patient says he was unable to reduce it, and paid no further attention to it until the morning of his admission to the hospital, when he felt excruciating pain in the abdomen, most marked along the right inguinal canal.

Later there were short intervals when the patient was fairly comfortable, but for the most part the pain was constant and severe. Soon after the onset of pain there was nausea and vomiting. Patient has had no movement of the bowel for two days.

**Physical Examination.**—Patient well developed and well nourished. Was very restless, constantly groaning, and had some hiccough. The abdomen was distended and very rigid. There was a tender mass in the right inguinal region the size of an

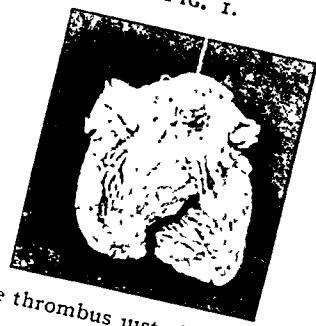
\* Read before the Medical Association of the Canal Zone, January 18, 1913. (From the Surgical Clinic at Colon Hospital, Cristobal, C. Z.)

In the application of the X-ray he arranges the cases in three distinct groups: (1) Cases in which the enlargement has not reached the operative stage. In a large percentage of such cases it is possible to check the progress of the disease by systematic and careful X-ray treatment combined with the essential constitutional measures. But it is not always possible to promote a complete absorption in some of the larger glands even though the disease process is checked because of the inability to remove the excessive degree of hyperplasia. (2) As a post-operative treatment in cases in which the glands have not begun to undergo caseation. Where operation has been limited to the removal of the large nodes, post-operative X-ray treatment may check the disease in the smaller ones. (3) As a post-operative treatment in cases in which caseation or suppuration has begun, especially in cases where sinuses have formed.

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FIG. I.



*Vegetative thrombus just above aortic valve.*

attended to. In those cases seen early with only a small area involved and where the child is in good general health, an operation should be advised. If the social position permits, this dissection should be confined to the macroscopic group with a minimum scar and the child sent to the seashore and kept from school for one year; the general and hygienic details of treatment being carried out with scrupulous care. In the case of the poor child or where such cannot be carried out, I think the entire submaxillary and cervical chains above the omohyoid should be excised. The general treatment must then be carried out at home. If the case is seen late with one or both sides choked up, the X-ray is often of advantage in reducing the hyperplasia and a radical dissection can be carried out at an opportune time. If caseous abscesses, sinuses, etc., exist they should be opened up, curetted out and an effort made to thoroughly clean up the tuberculous granulation tissue after which the X-ray is often invaluable in promoting healing. We prefer the transverse incision whenever possible, especially for the submaxillary and upper part of the deep cervical. When the mass has crossed posteriorly beneath the muscle or involved the posterior superficial cervical chain, an oblique incision from the posterior edge of the mastoid along the posterior edge of the muscle to just below its middle and then prolonged transversely to the thyroid muscles will give a large field area. Finally, intratracheal insufflation anaesthesia offers immense advantages in difficult cases, although pharyngeal insufflation anaesthesia suffices for the easy ones. At all times we must keep in mind that we are "not only treating a case of tuberculous glands but are dealing with a human being infected with tuberculosis. The difference between the two points of view is enormous and the success will largely depend upon the one chosen by the physician" (Hawes).

In conclusion I wish to express my indebtedness to Dr. Frazier for permitting me to collect and report his cases as well as for the privilege of using his wards for my own patients and in many instances for operating on his patients.

tery was thick and its layers were filled with extravasated blood. The lumen of the arterial branches was completely filled with a firmly organized clot. The veins were distended, although they were not occluded. We were unable to determine whether the condition was a primary thrombosis of the superior mesenteric artery or an embolism with a secondary thrombosis. In the light of the findings at autopsy, however, we are inclined to accept the latter view.

An autopsy performed December 24, 1910, 5 P.M., four and one-half hours after death, showed the pericardial and pleural cavities to be negative. The peritoneal cavity contained a considerable quantity of pus and yellowish purulent exudate covered the visceral and parietal layers. There was no attempt at union at the site of the anastomosis and leaking had occurred. The heart showed hypertrophy of the left ventricle and some dilatation of all the chambers. Situated just above the aortic valve was a vegetative thrombus the size of a ten-cent piece. (Fig. I.) The arch of the aorta was thickened and roughened by the presence of numerous atheromatous plaques. The rest of the aorta was similarly, though less markedly, involved. The other vessels were thickened and showed a loss of elasticity. The lungs showed a few scattered areas of bronchopneumonia in the lower lobes. The spleen was somewhat enlarged and its capsule thickened. On section two small red infarcts were demonstrated. The liver was about two-thirds the normal size, chestnut brown in color, and its surface roughened by numerous minute depressions. On section the interstitial tissue was much increased. The gall-bladder and its ducts, the stomach and pancreas, showed nothing abnormal. The kidneys were normal in size, hard and resistant to the knife. The capsule stripped with difficulty, coming off in two layers. The surface exposed was pale and granular. An occasional small cyst filled with clear, straw-colored fluid was noted. The cortex was somewhat reduced. The kidney architecture, while indistinct in some places, for the most part was good. The pia-arachnoid was markedly œdematosus. In the right frontal lobe there was an area of softening the size of an English walnut.

As to the frequency of thrombosis of the superior mesenteric artery alone, Merkel<sup>1</sup> states that there are over 150 cases on record, fatal in nearly every instance.

ciples of wound healing, and who have little knowledge of surgical dressings. If unfavorable results have been obtained by such individuals, I do not believe it is entirely due to the dyestuff.

I have found that these substances will not heal every wound, but, in the majority of instances, when applied with the proper technic, they will cause epithelial stimulation in the edges of the most sluggish wounds, and give a rapid, stable healing.<sup>2</sup>

The use of these coloring matters has also been objected to, by some who admit their power of epithelial stimulation, on the ground that there might be the possibility of producing epithelial overgrowths having malignant characteristics. It is a well known fact that malignant degeneration may occur in any chronic ulcer, even though only the blandest dressings be used. The consensus of opinion, deduced from experimental and clinical work, is that there is no more danger of producing malignant growths by the clinical use of these substances, than with any other dressing. My own experience in the treatment of a large number of cases has convinced me of this, and I feel no hesitancy in using the organic coloring matters on proper wounds.

I take this opportunity of warning against the indiscriminate use of these substances by inexperienced persons, as considerable harm may be done with them by improperly applied, and too long continued, dressings. There is, occasionally an overgrowth of epithelium following the use of these dyestuffs, even when the greatest care is exercised, but after discontinuing the stimulating dressing, this overgrowth soon assumes the level of the normal skin.

The following case shows the epithelial stimulating power of amidoazotoluol to a remarkable degree, and may be of interest.

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<sup>2</sup> Johns Hopkins Hospital Bulletin, vol. xx, No. 219, p. 176; ANNALS OF SURGERY, May, 1911, p. 702; Boston Med. and Surg. Jour., June 6-13, 1912.

dominal viscera, and, on the other, with the arteries of the different parts of the abdominal wall, such as the phrenic, intercostals and lumbar. In regard to the mesenteric vessels, he states:

"It (this plexus) passed downward between the folds of the mesentery, reaching as far as the coils of the small intestine and communicated with the branches of the superior mesenteric artery." According to DaCosta<sup>6</sup> an adequate collateral circulation occurs in about 5 per cent. of cases.

*Symptomatology and Diagnosis.*—There is no symptom complex characteristic of this condition. The diagnosis is rarely made before operation and can only be made by exclusion. Fortunately the indications for an exploratory operation are so imperative that such a refinement is unnecessary. Eisendrath<sup>7</sup> says it must be differentiated from the various forms of intestinal obstruction, perforations of gastric and duodenal ulcers, acute cholecystitis or appendicitis associated with acute peritonitis and the rare condition of angina sclerotica abdominis. Shoemaker<sup>8</sup> also includes acute pancreatitis, lead or renal colic, torsion of tumors and referred pain from pneumonia or pleurisy, especially diaphragmatic pleurisy. The condition most closely simulated is intussusception. Intussusception in 56 per cent. of cases occurs in children from the fourth month to the tenth year or in young adults,<sup>9</sup> while embolism or thrombosis of the superior mesenteric artery usually occurs in men past middle life and in those presenting evidence of cardiac or vascular disease. Intestinal hemorrhage is common in both, but it is more apt to be profuse in the embolic cases. A swollen and tympanitic abdomen is rare in the early stages of intussusception, while it occurs in nearly one-half of the cases of embolism.<sup>3</sup> Ordinarily the disease begins in one of two ways: (a) This form closely simulates intestinal obstruction with or without general peritonitis. It is characterized by sudden, agonizing abdominal pain, which is usually generalized and paroxysmal. Nausea and vomiting quickly follow and there is absolute

*Operation* (June 28, 1910).—Nitrous oxide-oxygen anesthesia. A number of large thin Thiersch grafts were obtained from the left thigh by the method used at the Johns Hopkins Hospital,<sup>2</sup> and the grafts were spread on protective and put aside. The thigh was dressed with boric ointment on protective, and the patient was allowed to regain consciousness. The granulating area on the arm was irrigated with salt solution and then dried carefully without causing bleeding. The grafts were button-holed and applied over a large part of the unhealed area. Rubber impregnated mesh was placed snugly over the grafts, and over this overlapping strips of protective, dry gauze and a bandage.

June 30. The dressings were removed down to the rubber mesh, which was not disturbed. The grafted area was irrigated with normal salt solution and dressed with 4 per cent. amidoazotoluol ointment on old linen, over the rubber mesh. This dressing was alternated with boric ointment every 24 hours.

July 12 (after six dressings with 4 per cent. amidoazotoluol ointment). The greater portion of the grafts had taken. Since the last note there had been a remarkable gradual thickening of all the grafts. The surface was smooth but rather uneven, and of a bluish grey color. The appearance was that of an edematous epithelial mass. The thickness varied between  $\frac{1}{8}$  and  $\frac{3}{8}$  of an inch. I felt convinced from my experience with occasional overgrowths of wound edges and other grafts caused by the organic coloring matters, that this thickening would begin to subside as soon as the stimulant should be removed. The thickened grafts were dressed with stearate of zinc powder and exposed to the air, in order to promote drying. The amidoazotoluol was discontinued. There was no excessive thickening of the wound edges.

July 20. The thickening of the grafts was still very marked, but the overgrowth had begun to separate into irregular-shaped fungating masses. When a section was removed for microscopic examination, there was little pain but profuse bleeding (Fig. 2).

July 22. Thiersch grafts from the left thigh were placed on the remaining undisturbed granulations and dressed with moist salt gauze over the rubberized mesh.

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<sup>2</sup> ANNALS OF SURGERY, September, 1909, p. 543.

constipation. If the occlusion in the artery is high up the vomitus may consist entirely of blood. The abdomen is much distended, tender and rigid. (*b*) This form is characterized by a predominance of the symptoms of intestinal hemorrhage. The patient is greatly prostrated, there are severe colicky pains and frequent bloody stools. In the early stages the symptoms of intestinal paralysis are usually less marked. In addition to these generally accepted and more common types there is a chronic form characterized by a more insidious onset and which may give rise to a large blood tumor between the layers of the mesentery. This form must be differentiated from cysts of the mesentery and other abdominal tumors.<sup>10</sup> According to Gerhardt<sup>11</sup> a typical case of embolism or thrombosis of the superior mesenteric artery should present the following features: A source for the embolus, profuse intestinal hemorrhage unaccounted for by a lesion of the intestinal wall or obstruction to the portal circulation, the characteristic paroxysmal pain, ileus and the presence of fluid in the abdomen, a rapid fall in the temperature, and the presence of a large palpable mass between the layers of the mesentery.

*Prognosis.*—In rare instances a collateral circulation may be established and spontaneous cure take place. Of the series reported by Jackson, Porter and Quinby,<sup>3</sup> 47 were subjected to operation and only 4 recovered, giving a mortality of 92 per cent. With an early exploratory operation the mortality may be materially reduced.

*Treatment.*—If the patient's general condition is good and there is present a sharp line of demarcation, a resection of the involved area with immediate intestinal anastomosis—preferably by a lateral method—would seem to be the ideal method of procedure. If this is impossible on account of a less favorable condition of the patient and there is no well-marked line of demarcation, a resection with the establishment of a temporary artificial anus would be the method of choice. Peritonitis as a complication should receive appropriate treatment.

(a) Taken January 7, 1911. Five months after discharge. The skin is movable and for the most part, smooth, although several thickened areas can be found. There is considerable pigmentation.

(b) Taken January 4, 1912. Seventeen months after discharge. The skin is marked by blotchy pigmentations, although several thickened areas can be found. The skin which are filled with comedon-like masses. Otherwise the skin is normal.



FIG. 3.

# THE CAUSE AND TREATMENT OF CERTAIN UN- FAVORABLE AFTER-EFFECTS OF GASTRO- ENTEROSTOMY.\*

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As a result of modern improvements in technic, the unfavorable complications, which were formerly not infrequent after gastro-enterostomy, have become more and more rare. It must, however, have been the experience of almost every surgeon that patients, upon whom a gastro-enterostomy had been performed, have at some later period complained of symptoms, which were often trivial in comparison with those of the condition for which the operation was carried out, but which were none the less sufficient to prevent the patient from regarding the result of the operation as entirely satisfactory. In the last few years I have been consulted by a considerable number of such patients, at intervals varying from a few weeks to several years after the operation, which had been performed for various conditions, but most commonly for duodenal ulcer. I have gradually come to recognize that the symptoms in a considerable proportion of the cases are due to a cause which has not hitherto been described, and in others are the result of a condition which has, up to now, only been incidentally referred to by Jonas,<sup>2</sup> in 1908. These two conditions, which I propose to discuss more fully in this paper, are in my experience considerably more common than is the recurrence of ulceration in the duodenum, the closure of the stoma or the formation of jejunal or gastrojejunal ulcer. They occur, of course, in only a small proportion of all the cases operated upon. I have seen about twenty cases, which have been operated upon by almost as many different sur-

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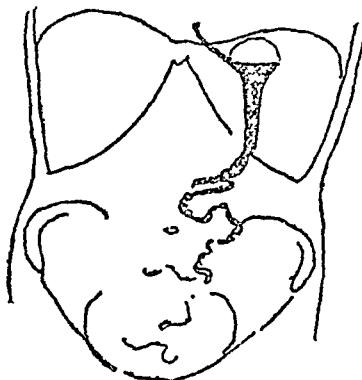
\* Founded on a paper read before the Surgical Section of the Royal Society of Medicine, February 11, 1913.



does not depend upon the condition of the pylorus, as I have seen more cases in which the pylorus was left patent at the operation than cases in which the pylorus was obstructed as a result of disease or by the surgeon in the course of the operation. Indeed, the most marked case I have ever seen was one in which the stomach was completely empty less than ten minutes after a bismuth meal was begun, and the pyloric passage had actually been widened by means of pyloroplasty at the second operation, which was performed on account of persistence of the symptoms before I saw the patient.

The rapid passage of the gastric contents through the stoma leads to distention of the proximal part of the jeju-

FIG. I.



Five years after gastro-enterostomy for small duodenal ulcer, which did not produce obstruction.

num in a way which never occurs normally, as the duodenum and end of the ileum are the only parts of the small intestine which are ever full under natural conditions. I believe this distention of the jejunum is the cause of the sense of fulness, as the experiments described in my Goulstonian Lectures proved that distention, which leads to stretching of the muscle-fibres, is the only adequate stimulus of visceral sensation. In confirmation of this, the situation of the sensation is found to be lower than that due to gastric distention, and corresponds to the upper limit of the situation of the pain felt when the small intestine is subjected to rapid distention. The patient sometimes finds that anything which increases the activity of

January 14, 1912. The arm was covered with a stable, movable skin, which was heavily pigmentated. On careful examination one or two very small thickened areas could be found on the inner side of the arm. There were also several comedon-like masses which filled minute pockets in the skin.

January 5, 1913. The condition of the skin had not changed since the last note.

*Histology.*—(Microscopic examination by Dr. Joseph C. Bloodgood.\* ) (Fig. 4.) There was an oblong piece of tissue with a central zone of oedematous connective tissue surrounded by epidermis. The papillary bodies of the epidermis were present. These papillary bodies varied in size and shape; they were larger and more irregular than in the normal epidermis. In some places the hornified epithelium on the surface was more marked than normal. Corresponding to these areas the epidermis was thicker than in areas in which the hornification was less. The epidermis differed from normal in the fact that the basal cell was not so distinct in its morphology, and in places the downgrowth of epidermal epithelium was more irregular than normal. We would speak of it as atypical. In one end of the section the central connective tissue looked myxomatous or oedematous. In the faintly stained intercellular substance there were a few round and stellate connective tissue cells, resembling, therefore, myxomatous tissue. Here and there there was a lymph vessel filled with leucocytes. At the other end of the section there was a defect in the epidermal covering, and this was filled with lymphoid-cell granulation tissue. This granulation tissue grew out from a narrow isthmus in the epidermis, and projected over the surface of the epidermis, like a fungous ulcer. On each side of the granulation tissue in the defect in the epidermis, the epithelial cells were extending irregularly into the granulation tissue. The cell proliferation in the granulating tissue was of the type of the transitional and squamous cell. This histological picture was somewhat similar to that seen in the beginning of carcinoma.

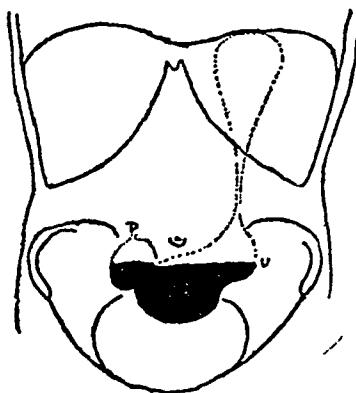
The other piece of tissue (Fig. 5) had the appearance of having been cut on the bias. The central zone of connective

\* I take this opportunity of thanking Dr. Bloodgood for the microscopic study.

If all treatment fails to give relief and the patient's symptoms are severe, it might perhaps be necessary to perform an operation with the object of diminishing the size of the stoma, or, if the pylorus is not obstructed, of restoring its activity by completely closing the stoma. The interesting question also arises whether surgeons have not gone somewhat too far in their desire to obtain sufficient drainage, and whether it would not be advisable in the future to make a somewhat smaller stoma than has commonly been made in the last few years.

2. *Situation of the Stoma above the Upper Level of the Gastric Contents.*—In cases of extreme dilatation of the

FIG. 2.



Pyloric obstruction due to duodenal ulcer; dilatation and hypertrophy of stomach. *P*, pylorus  
*U*, upper level of gastric contents.

stomach I have, on a number of occasions, observed that in the vertical position the whole of the gastric contents accumulate in the lowest part of the stomach in such a way that their upper limit is below the pylorus, and may not even reach the lesser curvature (Fig. 2). In such cases nothing at all can leave the pylorus, however strong peristalsis is, until the patient lies down. It is clear that in such cases an effective gastro-enterostomy must have the stoma so situated that it remains in the most dependent part of the stomach even when the vertical position is assumed. When the stomach is extremely dilated it must be exceedingly difficult to judge at an operation which will be the most dependent part when the vertical position is assumed, as, quite apart from any dilata-

It is interesting to note that Thiersch grafts which were subsequently applied to unhealed portions of the same wound, under exactly the same conditions, but without being dressed with amidoazotoluol were not thickened.

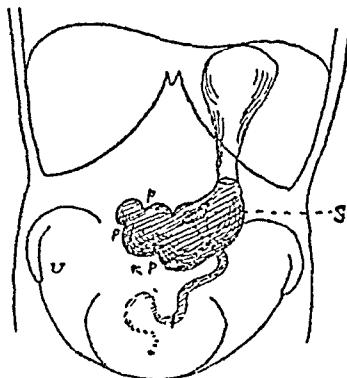
There was also great thickening of the deep pinch grafts placed on the undisturbed granulations of the ulcer on the scalp, which had been treated with amidoazotoluol before and after the application of the grafts. There was no such thickening, however, of similar grafts placed on undisturbed granulations, when not dressed with amidoazotoluol. There was distinct overgrowth of epithelium, "pebbly formation," on the thigh, when the area from which the Thiersch grafts were removed was dressed with amidoazotoluol ointment. Another area on the thigh from which Thiersch grafts were taken, but which was dressed with boric ointment, showed no "pebbly formation."

The patient has been under observation for over two years and a half since his discharge from the hospital, and there is no sign of malignant degeneration anywhere.

This condition is unique, and I can find no report in the literature of a similar case. It demonstrates beyond a doubt the epithelial stimulating power of amidoazotoluol. It also seems to show that although this stimulation is excessive, there is no tendency to subsequent malignant degeneration.

men the contents rose above the stoma and at once began to pass out of it (Fig. 5). By supplying the patient with an abdominal support and making him lie down for an hour after meals on his left side—the position in which I found that the drainage was most rapid—complete relief was eventually obtained. A somewhat similar case has been described by Jonas.

FIG. 5.



Same case as Fig. 4, with abdomen compressed so that the gastric contents can pass out of the stoma.

I believe that the notorious absence of success of gastro-enterostomy, when performed for severe atonic dilatation of the stomach without organic obstruction, must be due to a similar cause, drainage through the stoma being mechanically impossible.

#### REFERENCES.

- <sup>1</sup> Hertz, A. F.: "Constipation and Allied Intestinal Disorders," Lond., 1909, p. 19.
- <sup>2</sup> Jonas, S.: Archiv für Verdauungskrankheiten, 1908, xiv, p. 656.

orange. An examination of the heart revealed a loud, blowing, systolic murmur best heard over the aortic region. Lungs negative. Temperature on admission was 98° F.; pulse, 108, thready. The urinary examination showed a large amount of albumin and many hyaline casts. A diagnosis of strangulated inguinal hernia was made.

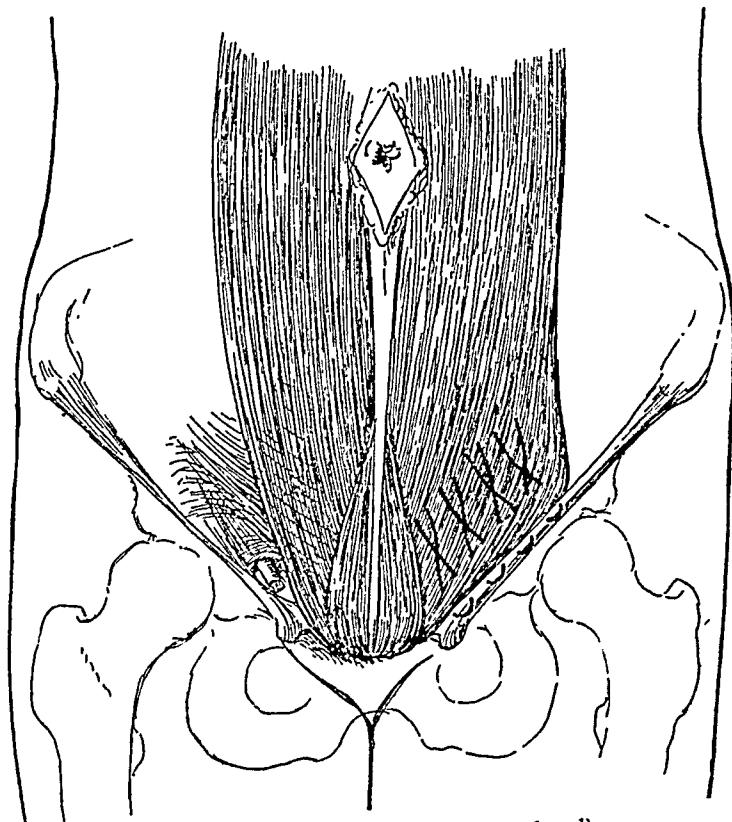
*Operation.*—December 20, 2.30 P.M. Ether anæsthesia. Inguinal incision. There was no strangulation at either ring. On opening the sac a small coil of gangrenous gut was revealed. As the condition was plainly not due to strangulation, the incision was enlarged upward, revealing numerous similarly affected coils of small intestine. The gangrenous area involved about eight feet of the ileum, extending to within five inches of the ileocæcal valve. (The area supplied by that portion of the superior mesenteric artery distal to the ileocolic branch.) There was a sharply defined line of demarcation above and below. In many places the wall of the gut was quite thin, although no definite perforations could be demonstrated. The mesentery was thick and œdematosus with its vessels standing out like firm, hard cords. The peritoneal cavity contained at least 2000 c.c. of thin bloody fluid, very offensive in odor. The peritoneum was markedly injected. There were no adhesions. The condition was evidently a hemorrhagic infarction with gangrene. The involved gut with its mesentery was resected, the edges of the mesentery were united with interrupted catgut sutures and a Murphy button anastomosis performed. The button was reinforced with a closely approximated circle of Lembert sutures. Split tubes were inserted for drainage and the wound closed. The patient left the operating room in fairly good condition, and for three days after the operation his general condition was fairly satisfactory. The temperature ranged between 99.5° and 101°. The pulse did not exceed 110. There was no further vomiting and little or no distention. On the third day there were two voluntary movements of the bowel. On the fourth day there developed marked distention and rigidity of the abdomen with hic-cough and a gradual rise of temperature and pulse. The patient died at 12.30 P.M., December 24.

Upon examination of the resected area the gut was found to be gangrenous and filled with a dark bloody fluid. Numerous ulcerations of the mucous membrane were noted. The mesen-

muscle, except in sutures placed well out toward the internal ring, is not included in the repair.

While many hernial recurrences take place through the internal ring rather than through the transversalis fascia as a direct hernia, a sufficient number do recur in this way to make the support of this weak area, internal to the transplanted cord, especially important in those doing heavy manual labor

FIG. I.



Deviation of fibres of rectus (after Bloodgood).

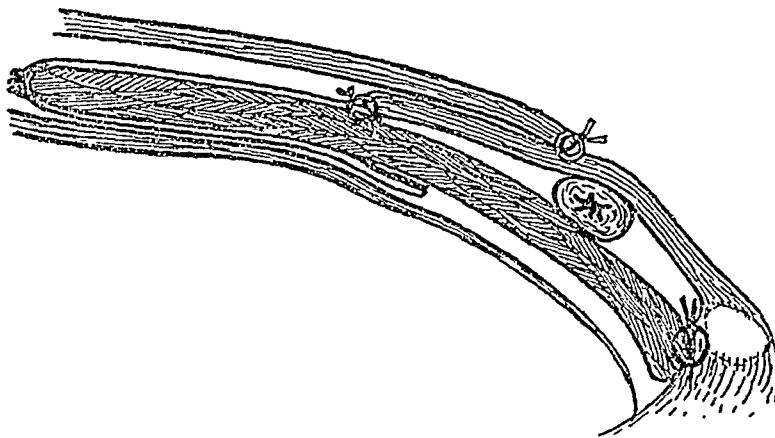
and in whom the internal oblique muscle is insufficient for adequate protection. Not a few of these cases with weak transversalis fascia and large herniae have, nevertheless, a good internal oblique, quite sufficient for the Bassini operation without embellishments. Some of them have not. On the other hand, there are those with but moderate sized herniae who are markedly deficient in oblique muscle, there being scarcely more than enough to insert the external suture of



where it was done in the presence of obliterated transversalis fascia, there were no relapses at the lower end of the wound, while 62 per cent. of similar cases done by the Halsted operation alone recurred. Its adjuvant effect in this operation is therefore marked, when indicated.

We have the choice of a number of operative procedures, depending upon the anatomical condition and based upon or combined with the Bassini operation. In the presence of a good internal oblique muscle, its internal attachment is weakened if the rectus sheath is opened anteriorly, and this is

FIG. 2.



Schematic diagram of arrangement of rectus and external oblique fascia.

contra-indicated both in direct and in indirect herniae; for the indirect, the straight Bassini is sufficient, and for the direct many times as well. In *deficiency* of the internal oblique, rectus transplantation with or without utilizing the remaining portion of the oblique, as an additional Bassini, is of assistance both in direct and indirect herniae. In moderate-sized indirect and direct herniae with marked oblique deficiency, the rectus sheath may be opened anteriorly and the muscle transplanted in a manner I wish to speak of later, and that has proved very simple and most satisfactory in some 12 cases. In the larger herniae indirect and direct with oblique deficiency, we have but scanty structures to interpose, and rectus transplantation is at its maximum of usefulness. The sheath

*Etiology.*—The same factors which lead to embolism and thrombosis in general may occasion embolism and thrombosis of the superior mesenteric artery. Among the most common causes may be mentioned arteriosclerosis and endocarditis. It occurs most frequently in men past middle life.

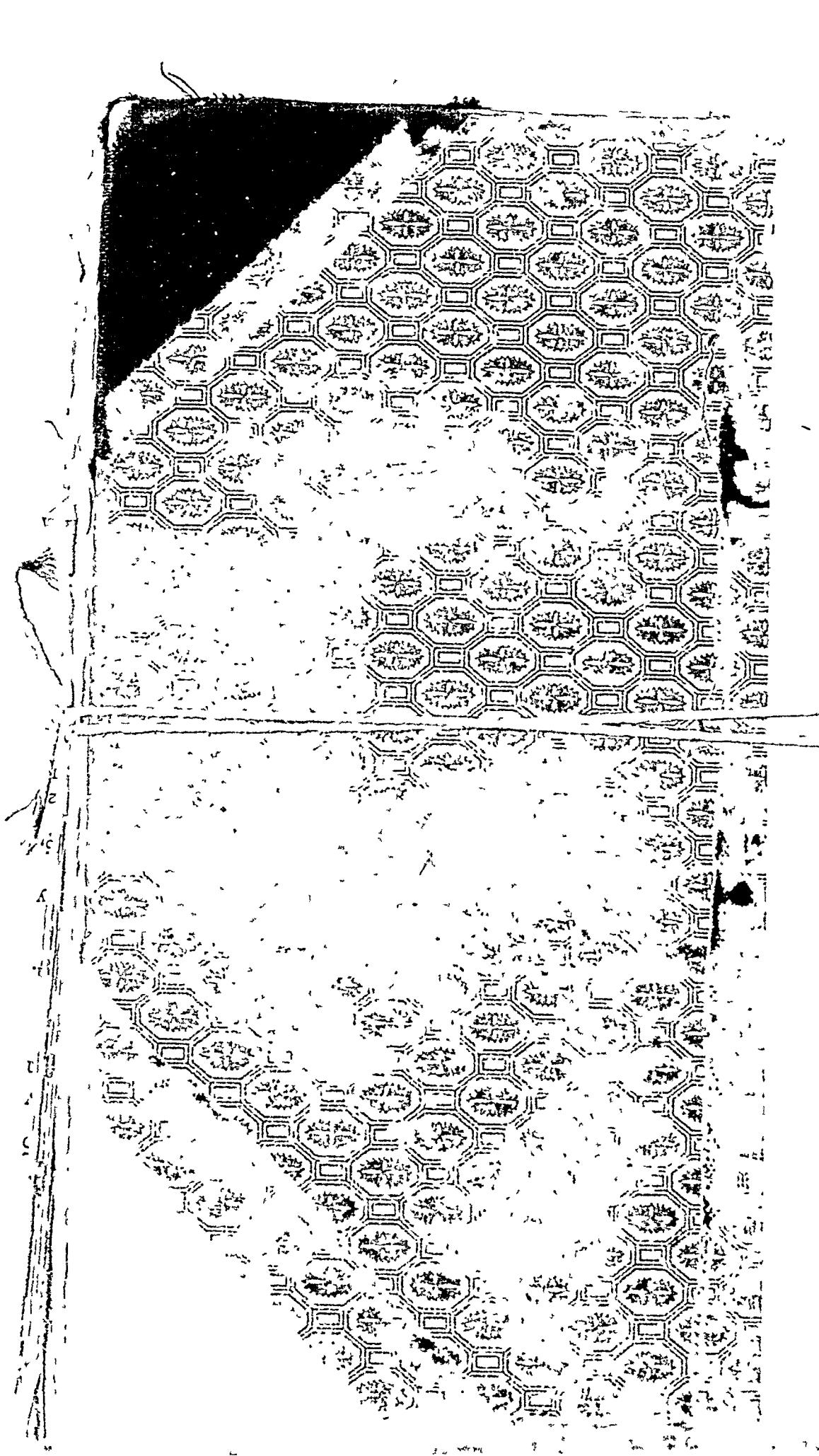
*Pathology.*—According to Welch<sup>2</sup> the usual effect of occlusion of the superior mesenteric artery is hemorrhagic infarction of the small intestine, corresponding to the distribution of the involved vessels. The intestinal wall is thickened, edematous, and of a dark red color, and covered with lustreless peritoneum. There is usually a sharp line of demarcation, although the margins of the infarct may pass gradually into the healthy bowel. Jackson, Porter and Quinby,<sup>3</sup> in their elaborate presentation of this subject, state that in three-fifths of the cases a line of demarcation is present. Their study was based upon a series of 214 cases of mesenteric embolism and thrombosis, and included practically all of the reported cases up to the year 1904. (Both arterial and venous varieties included.) In rare instances the gut may be gangrenous without typical hemorrhagic infarction. The mucous membrane may or may not be necrotic and perforations with general peritonitis may be present. The lumen of the bowel is distended with dark, tarry blood. The peritoneal cavity usually contains considerable amount of bloody fluid. The mesentery is thick and edematous with small hemorrhages scattered here and there. In some cases the hemorrhagic extravasation may be so extensive that an abdominal tumor is simulated as in the case recently reported by Thévenot and Rey.<sup>4</sup> The mesenteric glands are often swollen. While hemorrhagic infarction of the small intestine is the usual result of closure of the superior mesenteric artery, the occlusion may take place so slowly that no serious effects are noted, due to the establishment of a collateral circulation. Such a favorable termination may be effected through what has been termed the "subperitoneal arterial plexus." This plexus was described by Sir William Turner<sup>5</sup> in 1863. It communicated on the one hand with the arteries of the ab-

3, 14-day chromic sutures. The cord lays upon this bed. The outer half of the external oblique aponeurosis is sutured to the internal half of the rectus sheath. This overlaps the line of union of muscle to Poupart's ligament and closes over the rectus muscle. The inner half of the external oblique aponeurosis is drawn down over the line of union of the outer half with the rectus sheath with a few mattress sutures. Externally, one or two sutures of chromic gut bring into close apposition the cut edges of the aponeurosis.

Adequate rest in bed of 20 to 21 days seems proper in all hernia operations, the function of sutures being to bring tissues into apposition for union without strangulation and not to take the mechanical strain which the tissues themselves are capable of doing when properly united by first intention.

All the cases done by this method were heard from or seen over a year later, and a few two years after operation, with the exception of four done since the first of January who were seen within the last week, and repair has been apparently perfect in all.

The various procedures utilizing the rectus muscle have a definite usefulness and indication in a certain number of cases, where the operation is made to fit the condition and not the condition to a typical operation, however good that may be.



canal; *b.* ligature of neck of sac; *c.* suture of conjoined tendon over cord to Poupart's ligament.

Recurrence takes place often a year or more after the operation. The hernia appears to the inner side of the internal ring and pushes forward the parietal peritoneum and transversalis fascia.

A section of the inguinal ring shows the weak spot left by this operation. A tent-like space is found by the conjoined tendon stretching across the cord. The internal ring is not constricted. Out of fifty-seven cases of recurrent hernia which have come under my observation, 45 followed the operation indicated above. Hernia to the outer side of the internal ring or direct hernia does not follow this operation.

3. Cases operated upon as follows: *a.* Opening inguinal canal; *b.* ligature of neck of sac; *c.* suture of conjoined tendon beneath cord to Poupart's ligament.

The internal ring is efficiently constricted. Recurrence is rare after this operation and when it occurs it occurs to the outer side of the internal ring.

The case operated upon by the writer recurred four months after operation. Only seven out of fifty-seven recurrences had been operated upon by this method.

4. Cases operated upon by ligature of the sac alone.

Relapse usually follows by a protrusion of the parietal peritoneum through the internal ring, which has not been constricted by the operation, or appears to the inner side of the internal ring.

5. Cases operated upon by ligaturing the neck of the sac and displacing the ligatured neck by buried sutures.

In this method the weakest point of the abdominal wall is transferred from one point to another. Normally the internal ring is the weakest point and if the neck of the sac be displaced outward and a typical Bassini operation performed, the weak point becomes the area immediately to the outer side of the internal ring. The procedure of displacing and burying the neck of the sac is probably one of the most valuable.



The next step is to constrict the internal ring and strengthen the posterior wall of the inguinal canal. This is done by separating the two muscles forming the conjoined tendon and having lifted the cord, suturing the transversalis muscle and conjoined tendon to Poupart's ligament.

The internal oblique is now sutured over the cord to Poupart's ligament, commencing about one inch and a half to the outer side of the internal ring.

By this step the area to the outer side of the internal ring, where relapse occasionally occurs, is strengthened, adequate muscular pressure is obtained over the internal ring and the pressure of the transversalis which now forms the posterior wall of the inguinal canal is reinforced. The spermatic cord now passes between the two muscles which form the conjoined tendon and a recurrence of hernia along the cord is efficiently prevented. It is rarely necessary to lessen the size of the cord by removing some of the veins and coverings. Fishing gut sutures are employed for these deep stitches, the knot is tied three times and the ends cut short. No after trouble appears to occur from the use of these hard and unabsorbable sutures—I have used kangaroo tendon in many cases but consider ordinary fishing gut a better suture.

The inguinal canal is closed by suturing the divided aponeurosis of the external oblique.

## AFTER-EFFECTS OF GASTRO-ENTEROSTOMY.

geons; they therefore represent a very small percentage of cases in the practice of each individual surgeon. They are, none the less, of considerable importance, as their recognition and treatment often results in the conversion of a comparatively unsuccessful case into a completely successful one.

1. *Too Rapid Drainage of the Stomach.*—The patient complains of a sensation of fulness, which occurs during each meal, and which may be so unpleasant that the amount of food taken is progressively diminished and a considerable loss of weight may finally occur. The sensation disappears rapidly, and the patient may find that by eating with extreme slowness he is able to prevent its occurrence. Many patients recognize that this sense of fulness is localized slightly lower than the position where the pain or discomfort, for which the operation was performed, was felt.

In some cases the patient also complains of slight diarrhoea, the bowels being opened after each meal; the first stool passed in the day is generally solid, but the later ones are unformed and occasionally fluid. In rare cases the diarrhoea may be severe, and a case which has been reported of a patient dying from diarrhoea after gastro-enterostomy was probably of this nature, no organic cause having been discovered at the autopsy.

In all patients suffering from this group of symptoms I have found with the X-rays that the stomach was small and hypertonic and that the passage of food out of it was extremely rapid, so that a meal, consisting of half a pint of porridge and milk mixed with two ounces of bismuth oxychloride or barium sulphate, left the stomach in less than an hour, and in one case in less than ten minutes after being taken, instead of requiring the normal three or four hours. If the patient is watched whilst he is taking the meal, the outflow from the stoma may indeed appear to be almost as rapid as the inflow from the oesophagus (Fig. 1). In all cases little or nothing passed through the pylorus, and sometimes the chyme even failed to reach the portion of the pyloric end of the stomach beyond the stoma. The rapidity of escape through the stoma

long and there were no adhesions about the caput coli, nor anything that would indicate an inflammatory process in that neighborhood. The tumor, which we had felt before the operation, was found to be a tense band of fascia along the inner side of the psoas magnus, attached to the borders of the upper lumbar vertebræ and below to the pelvis.

An opening was made through the posterior parietal peritoneum and the band cut. So great was the tension it snapped loud enough to be heard by the assistants. Additional bands of fascia running through the psoas magnus were incised and all tensions relieved. The patient made an uneventful recovery, and went home two weeks after the operation.

A letter from Dr. Currie, dated March 28, 1912, three and a half years after the operation, states that relief was complete and permanent.

The next case occurred about two years later.

CASE II.—January 19, 1911, B. W., twenty-seven years, married, three children. Patient is a healthy country woman, not of a nervous temperament.

Two years ago, about two months before confinement, she was taken with a sudden severe pain in the right iliac fossa. It partially subsided in a few minutes, but the side remained painful and tender. After delivery the pain gradually increased and became so great that she has been an invalid for the past year and a half, spending most of her time in bed. The pain, which starts from the right iliac fossa, extends down the leg, up to the shoulder, and sometimes to the opposite side. She walks bent over, and lies on the right side with the legs drawn up. She has indigestion and is constipated, but has had no fever.

Examination shows a flaccid abdomen with no rigidity of the muscles. There is a tumor in the right iliac fossa, which could not be palpated satisfactorily on account of extreme tenderness. The pelvic organs were negative. The right kidney is movable. Passive motion of the leg is painless. From experience with the previous case, the diagnosis was made before the operation. The appendix was found normal with no evidence of inflammation in the neighborhood.

The psoas parvus was found in a state of contracture and projected forward into the abdominal cavity, resembling a tumor. The main tendon together with several accessory bands were

## AFTER-EFFECTS OF GASTRO-ENTEROSTOMY.

the small intestine, such as exercise or a dose of castor-oil, though it may increase the discomfort, makes it disappear more rapidly than it would otherwise, doubtless because the distention of the jejunum lasts for a shorter period.

Confusion with the symptoms arising from a jejunal or gastrojejunal ulcer is prevented by the fact that the nature of the diet has a considerable influence on the latter, whereas, in this type of this post-operative indigestion, the quantity and not the quality of the food is alone of importance.

The diarrhoea is mainly due to the irritation of the bowels by the food, which escapes from the stomach too rapidly for efficient gastric digestion; owing to the absence of the normal stimulation of pancreatic secretion by hydrochloric acid in the duodenum it does not undergo sufficient compensatory digestion in the intestine. It tends to occur after meals owing to the normal gastrocolic reflex, which I have shown leads to an increase in the peristalsis of the colon whenever food enters the stomach.<sup>1</sup> In all probability there is also an enterocolic reflex, which arises from distention of the jejunum and produces the same result.

Complete relief or considerable improvement occurs if the patient is instructed to lie down for half an hour or an hour after each meal, as it is found with the X-rays that the stomach empties itself much less rapidly when this posture is assumed, the stoma no longer being in the most dependent position. In some cases it is better to lie on the right or less frequently on the left side, the best position being easily ascertained by watching the rate of evacuation with the X-rays. The patient should also be given some active preparation of pancreatic ferments, such as pankreon, at each meal, in order to compensate for the deficiency of the normal secretions. If the sense of fulness is still experienced, in spite of the treatment I have described, small doses of belladonna, which causes the involuntary muscle-fibres of the intestines to relax, and of codeine, which diminishes the excitability of the visceral nervous system, should be given half an hour before meals.

CASE IV.—T. L., single, sixteen years, Jewess. Patient is of a decided nervous temperament and is employed as a telephone exchange operator, a work that exaggerates her neurotic tendencies.

February 21, 1912, while at work she was taken suddenly with a pain in the right side so severe that she fainted. She was taken home and during the next two days suffered intense pain in the right side of the abdomen and down the leg. Vomiting took place soon after the attack and continued at intervals during the next day. There was no rise of temperature. Examination when first seen, three days after the attack, showed great rigidity of the right abdominal muscles, exquisite tenderness over McBurney's point, and an ill defined tumor in the right iliac fossa.

The operation disclosed a perfectly normal appendix, but a tensely contracted psoas parvus muscle. This was cut retroperitoneally with immediate relief.

She was examined April 1, 1912. The side was neither painful nor tender, and she was going about with comfort.

March 4, 1913, the patient was seen again, complaining of pain in the left side, which came on suddenly while at work, and was severe enough to keep her in bed. There was no fever and no digestive disturbance. Examination showed tenderness in the left iliac fossa, rigidity of the left abdominal muscles and a mass in the left iliac fossa, which was diagnosed a contractured psoas parvus. She was seen by Dr. Walter Wilson and Dr. Walter Norton, who confirmed the diagnosis. March 6 she was operated upon the second time. The tendon was exposed retroperitoneally, and was found to be in a state of tense contracture, projecting forward almost like a knife blade. It was incised, relieving all tension. Recovery was uneventful. She left the hospital on the twelfth day, and when seen last, April 13, she was feeling well, and ready to go to work.

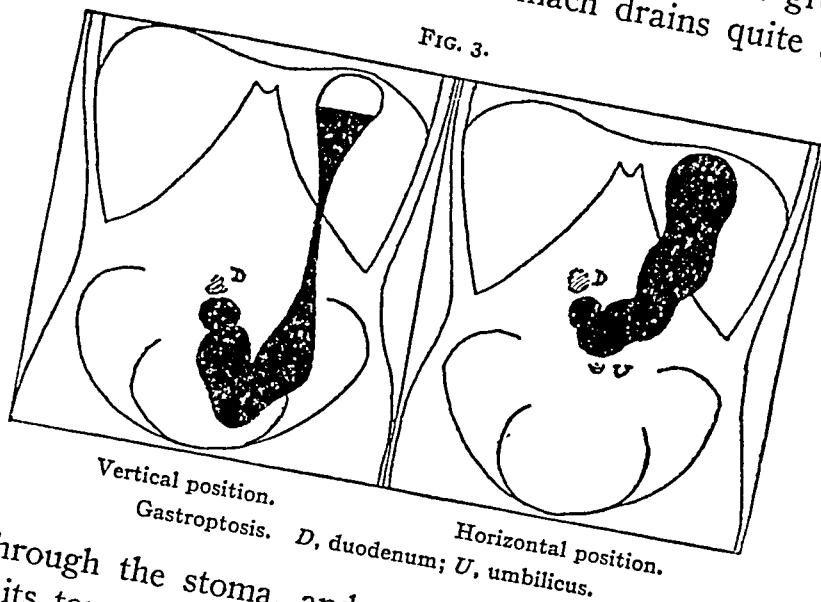
This is the only case in the series in which marked involvement of the left tendon has been observed.

CASE V.—April 17, 1912, Mrs. S. E. A. The patient is sixty-nine years old and shows the effects of her years. She suffers from indigestion, constipation and neuralgia. Twelve years ago she began to have attacks of pain in the right iliac

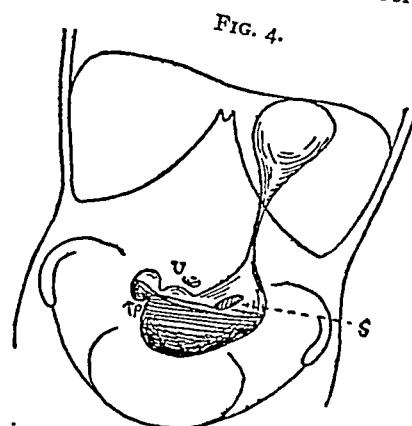
## AFTER-EFFECTS OF GASTRO-ENTEROSTOMY.

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tion, the influence of posture on the position of the stomach may be remarkably great (Fig. 3). Fortunately, the rest in bed and the strict diet after the operation are a great safeguard; whilst lying down the stomach drains quite satisfac-



torily through the stoma, and consequently regains a great deal of its tone. I have, however, seen one case of dilated stomach due to simple pyloric obstruction, in which no im-



Gastro-enterostomy for pyloric obstruction. Stoma above the upper limit of the gastric contents in the vertical position. U, umbilicus; P, peristaltic waves; S, stoma.

provement resulted from operation, and in which we found that in the vertical position the upper limit of the gastric contents did not reach as high as the stoma or the pylorus (Fig. 4), but that on compressing the lower part of the abdo-

Besides these marked cases, the condition has been observed in a minor degree and associated with floating kidney, chronic appendicitis, and Jackson's veil, but the tension was apparently not great enough to produce symptoms.

In these seven cases the pathological conditions were practically the same. The psoas parvus tendon was under considerable tension, which was not relieved by an anæsthetic and caused the tendon to project forward toward the abdominal cavity, simulating a tumor when felt through the abdominal walls.

Regarding the etiology and pathology of the condition, I know nothing. Spastic muscular contractures in various parts of the body are well known, those of the neck being the most common. They are usually attributed to functional neurosis, organic disease of the nervous system, syphilis, or rheumatism. Contractures in this locality are not discussed in available literature. All I can find is the following:

Writing upon muscular contractures in *Die Deutsch Klinik*, Remark dismisses the subject by the statement that clonic and tonic spasms of the ileopsoas and rectus femoris without assignable cause, have been reported in neurasthenics by Klemperer, Koch and others.

The psoas parvus, according to the books, is an inconstant, rudimentary muscle, attached above to the last dorsal and first lumbar vertebræ, and below to the ileo-pectineal line of the pelvis. In these seven cases the muscle was represented by a band of fascia, extending along the inner borders of the psoas magnus, and receiving fibrous bands from each of the neighboring vertebræ. The function of the muscle in the lower animals is to bend the pelvis on the spine, a motion almost lost in man. It is not surprising that this muscle, which is undergoing retrograde evolution, should take on some pathological condition, and the excessive pain from its contracture may be accounted for by the fact that the attachments are to relatively fixed structures, so that the tension cannot be relieved by flexion of the parts.

An analysis of the cases shows that pain, tenderness and

## RECTUS TRANSPLANTATION FOR DEFICIENCY OF INTERNAL OBLIQUE MUSCLE, IN CERTAIN CASES OF INGUINAL HERNIA.\*

BY WINFIELD SCOTT SCHLEY, M.D.,

OF NEW YORK,

Assistant Surgeon to St. Luke's Hospital.

THE desirability of including muscle in the suture of abdominal wounds in addition to fascial and aponeurotic structures, not only to secure as broad a union as possible but to counteract the stretching of the union of fascia and aponeuroses, has long been recognized in guarding against hernial separation.

From time to time patients with the inguinal variety of hernia present themselves in whom the internal oblique muscle is markedly deficient; in some the transversalis fascia at the base of Hesselbach's triangle is thin to the point of obliteration as well, and when the external oblique aponeurosis is divided three or four fingers can be pushed into the abdomen, invaginating the atrophic transversalis fascia, properitoneal tissue, and peritoneum. The protrusion at the internal ring may extend for several fingers' breadth toward the pubes, thinning out the ligamentum inguinale of the transversalis fascia and possibly even extending to the inner vertical fibres. The transversalis aponeurosis, normally deficient for a short distance above Poupart's ligament in the region of the inguinal canal, is not only thin but narrow in these cases. It can rarely, if at all, be utilized in the Bassini operation.

A discussion of the anatomy of the inguinal region is hardly in place at this date when the so-called conjoined tendon is so generally recognized as a myth, as far as its usefulness in the Bassini operation is concerned, and the internal oblique recognized as our mainstay, forming as it does so much of the anterior wall of the inguinal canal. Even the transversalis

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\* Read before the New York Surgical Society, April 23, 1913.

# THE REDUCTION OF THE FRAGMENTS PRELIMINARY TO INTERNAL SPLINTAGE IN CASES OF FRACTURE OF THE LONG BONES.

BY G. H. COLT, M.B., F.R.C.S.,

OF ABERDEEN, SCOTLAND,

Assistant Surgeon to the Royal Infirmary.

IN ANNALS OF SURGERY, November, 1912, p. 769, Gerster publishes an interesting article on "The Reduction of the Fragments in Fractures of the Long Bones." The need for some mechanical device to effect reduction has long been felt. During the operation great difficulty is often experienced in reducing and maintaining the fragments in correct alignment while a Lane's plate is applied and this is particularly the case in fractures near the middle of the shaft of the femur of some weeks or months duration, so much so that occasionally after repeated attempts at reduction have failed it is necessary to remove portions of the ends of the bone in order to obtain correct apposition. Although much can be done by extension applied immediately in recent cases and particularly by employing Jones' method with a Thomas' knee splint, there still remain a certain number of cases in which the result is bad. The requisite care in nursing may not always be attainable and in outlying districts medical aid may not be so easily procured as in towns. Such cases come to operation. During the operation much of the force used in producing extension is applied through the knee-joint and sometimes synovitis is set up. The procedure is the reverse of elegant and is excessively tiring to the assistants. When operation is performed in the house occupied by the patient there may be difficulty in finding supports for any pulley extension such as the operator is accustomed to use in his own theatre. These considerations led me in October, 1911, to devise an apparatus that would help to render reduction easy. It was clear that the method should involve applying the force of separation as a

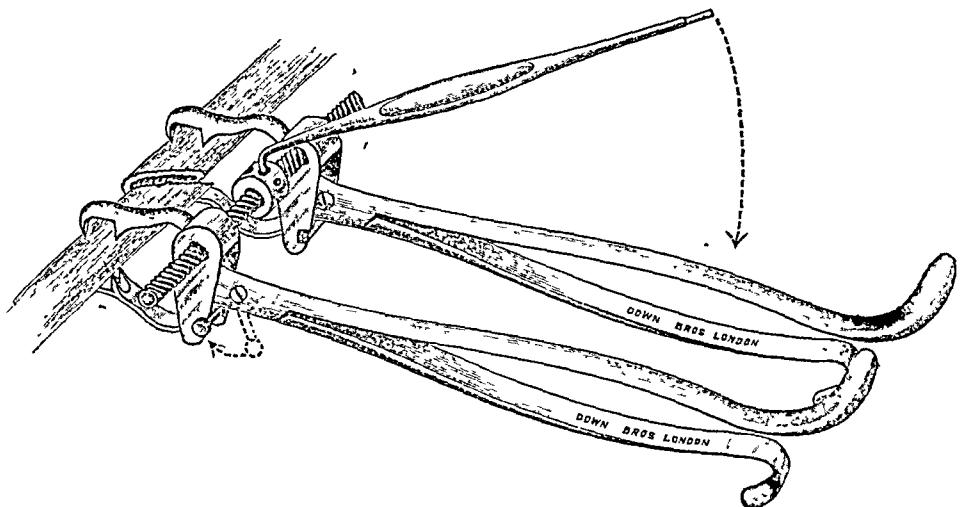
Coley beyond the cord. For these cases, a few only of the total number (Bloodgood states as high as 7 per cent.), the transplantation of the nearby muscle of the rectus has served extremely well.

The literature upon the subject of rectus transplantation is not voluminous and in it but little distinction has been drawn between the different anatomical conditions and the operative procedure most applicable to each. The procedure, usually spoken of in this country as Bloodgood's and published by him in 1898, is not altogether of this late date. Bassini, in his original communication in 1890, recommended suture of the lower border of the rectus to Poupart's ligament in the two or three sutures taken nearest the pubes. Wölfler, in 1892, reported in Billroth's *Festschrift*, 51 of 58 cases done by a complicated technic of his own in which the cord was transplanted back of the rectus, the internal oblique sutured to Poupart's ligament, and lastly the rectus drawn out of its sheath anteriorly and sutured to Poupart's ligament as well. This anterior opening of the rectus sheath weakens the internal attachment of the already sutured internal oblique if it be well developed. The transplantation in his cases as a routine seems unwarranted, as the internal oblique was sufficient for the typical Bassini. The recurrences were about 5 per cent. Bloodgood more recently has opened the rectus sheath from behind, obviating this disturbance of the internal attachment of the muscle. Slajmer, in 1898, reported 150 cases done by a modified Wölfler method without cord transplantation. After freeing the layers his outer two sutures bring the internal oblique to Poupart's ligament, the next two the outer part of the anterior sheath of the rectus and the rectus muscle edge to Poupart's ligament and the external oblique fascia, and the last two the inner edge of the rectus sheath and external oblique fascia. Two final sutures close the external ring. This method is open to much the same objection as the preceding. The recurrences were about 4 per cent. The adaptation of the rectus transplantation to the Halsted operation was Bloodgood's, and in 14 cases, of an early communication,

may or may not be convenient to remove the extending instrument according to the case. The plating is now proceeded with. The instrument affords the following advantages:

First, it is applicable to all the ordinary bone-holding forceps of the Lane type in general use, so that no additional or special forceps need be provided. By using a Lane forceps much room is gained in the wound for manipulation of the plate because the bows of the Lane forceps afford ample room for inserting the plate and screws while the forceps are still

FIG. I.



in position. The great desideratum in these operations is more room in which to work without increasing the size of the wound.

Secondly, it is not necessary to interrupt the process of extension and change the apparatus. The length of screw provided is sufficient for all ordinary cases in which the fragments have been separated as far as possible before the forceps are applied. In many cases the instrument will not be required, such as recent cases in which extension has been employed from the first. Such cases are treated by open operation because of the difficulty of securing proper attention when external splints and extension are used. At operation complete reduction is easily obtained, but occasionally it may be helpful to have the instrument at hand. In cases in which

should be opened behind the attachment of the internal oblique and transversalis aponeurosis, and the muscle brought down to Poupart's ligament, what is left of the internal oblique fascia over all to the ligament as well and the external oblique muscle to In all cases, where there is sufficient internal oblique muscle to use internally to the transplanted cord, it seems wiser to open the rectus sheath from behind, and bring the muscle down behind the oblique. In marked deficiency of the oblique, little or no harm results from opening the sheath in front.

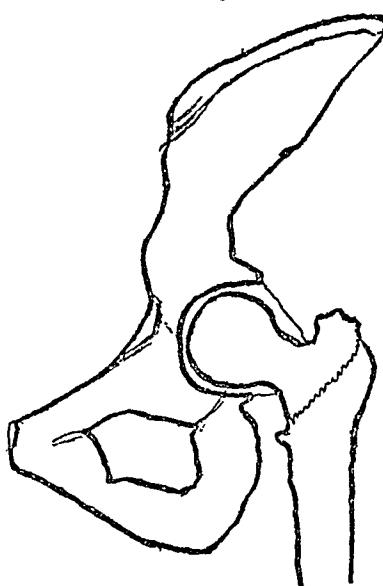
Downes, in a number of these cases of direct hernia and of hernia recurring after operation through the transversalis fascia, has done this combined operation; Blake, at a somewhat earlier date, as well. The Mayos, in similar cases, have utilized what remained of the internal oblique and sutured this together with external oblique aponeurosis well down on the sloping shelf of Poupart's ligament, the outer half of the external oblique muscle and fascia overlapping the line of union and the internal half. They do not expect over 1 per cent. recurrence. Halsted has turned down a flap from the anterior sheath of the rectus. Berger, in 1902, did the same. The use of muscle tissue in addition to aponeurotic structure seems the method of choice.

Transplantation, or transposition, of the lower part of the rectus muscle does not markedly alter the direction of its fibres, or result in tension on suturing, if an adequate opening be made in the sheath. Furthermore, as remarked by Russell, the new relations of the rectus formed materially aid in maintaining its new position. The method I have followed in some 12 cases of indirect hernia, with markedly deficient internal oblique and weak transversalis fascia, has been to first utilize what remains of the oblique muscle, usually only that part external to the internal ring and transplanted cord, by inserting Coley's stitch. The rectus sheath was opened for three inches a quarter of an inch from its edge, the incision beginning below the insertion of the aponeurosis of the remaining good oblique, the muscle loosened from its sheath and drawn down to the thoroughly cleaned shelving edge of Poupart's ligament by four No. 2 or

the trochanter minor, at the same time splitting the two trochanters from one another, and allowing of the neck of the bone being wedged in between the two; in which position it is often so firmly fixed that it is "impossible to make extension sufficient to unlock the portions of bone from one another. The wood cut represents the kind of fracture." (Fig. 4.)

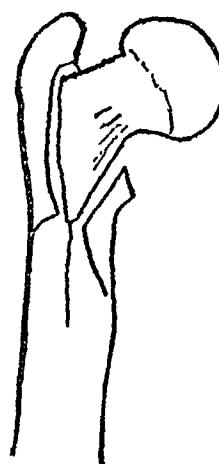
Malgaigne, with his fondness for refinements in classification, speaks thus of extra-capsular fractures:

FIG. 3.



Fracture through the trochanter major (Cooper).

FIG. 4.



Fracture through the great trochanter (Lonsdale).

"The type is at the base of the neck; but two sufficiently rare varieties are when the fracture is (1) just internal to the typical site (partly intra- and partly extracapsular); (2) just external or below. This second variation from the type is much the more important—the result is that the fracture essentially divides the great trochanter, which becomes part of the upper fragment. But it is excessively rare for such a fracture to be single; the multiple (*i.e.*, comminuted) fractures are incomparably more common. And of these comminuted fractures there are two main types: (1) The great trochanter is fractured as well as the neck, and constitutes a *third fragment* (the more common type); (2) the lesser trochanter is fractured also (as well as the great trochanter and neck) and forms a *fourth fragment*." Other rarer types, he adds, are (1) Where the third fragment is formed by the lesser trochanter alone, the greater trochanter being part of the upper fragment; (2) where the great and lesser trochanters are united in the same fragment; (3) those where the greater trochanter alone is comminuted. He writes (p. 714), when speaking of sub-trochanteric fractures, "when the fracture is very close to the lesser trochanter, it is often enough comminuted and combined with an extracapsular fracture"; but his classification, while more elaborate, is much less easily comprehended than that of Sir Astley.

## RECURRENCE OF INGUINAL HERNIA.

BY A. J. HULL, F.R.C.S. (Eng.), Major, R.A.M.C.,  
OF LONDON.

A FEW years ago it was the practice of surgeons when considering the advisability of operating for the radical cure of inguinal hernia, to point out that the operation "only put the clock back" to the conditions of affairs which existed previous to the development of the hernia.

This view is no longer generally held. Surgeons who believe in the presence of an abnormal process of peritoneum being the sole cause of hernia, will, if they follow their belief to its logical conclusion, believe that efficient treatment of the sac will invariably cure the hernia. There is no doubt, however, that hernias treated by efficient ligature of the sac and an additional plastic operation upon the inguinal canal do recur. It is probable that the high percentage of failures published in some statistics is due to the fact that many cases treated by obsolete methods of operating were included and that if a large number of cases could be traced which were operated by modern methods of performing the radical cure the results would show that the operation is one of the most certainly successful in surgery—I am inclined to this view by the fact that I have rarely found that a typical Bassini operation with displacement of cord has been performed when operating for recurrence of hernia after operation.

An examination of the methods of recurrence of hernia will guide us to the most satisfactory operation for its radical cure. The type of relapse is found to follow accurately the type of operation originally performed.

1. If the sac has not been ligatured or sutured sufficiently high up, the hernia rapidly recurs in the sac.

2. Cases operated upon as follows: a. Opening inguinal

Now it may be asked by the unprejudiced observer (and such usually is the medical student), "What is the use, and where the sense, in describing as *typical* a type of fracture *through the trochanters* which is *extremely rare*, and most cases of which are 'atypical'; while we regard as *atypical* a form of fracture which is quite common?"

My object in preparing this note on *fractures through the trochanters of the femur* is to call attention to this very fact; that the fracture usually considered typical is so rare that it should be considered atypical; while the "atypical" fractures, so-called, are comparatively very frequent.

Some years ago I had occasion to make a collection of skiagraphs of "typical fractures." My search through the many thousands of negatives stored at the Episcopal Hospital enabled me to find at last one skiograph which corresponded to what is described in modern text-books as a *typical fracture through the trochanters*. I reproduce that skiograph here as Fig. 9. I was struck with the great infrequency of the type, and began to keep my eyes open for other examples of fractures through the trochanters of the femur. Last autumn one of our resident physicians at the Episcopal Hospital asked me whether fractures of the lesser trochanter of the femur were not excessively rare. I replied that isolated fractures of the lesser trochanter might be, as I did not recall having seen any; but that at the time we were speaking there were in Dr. Frazier's wards in the Episcopal Hospital no less than four fractures through the trochanters of the femur, involving separation of the lesser trochanter. And inasmuch as it did not seem that the frequency of this injury was generally recognized, I thought it might be worth while to bring the subject before you to-night. I include in the series of cases two patients from Dr. H. C. Deaver's service at the Episcopal Hospital. Thus there are *six cases of fractures through the trochanters of the femur* in one hospital in a period of six months. This fact alone is testimony to the frequency of this "atypical" type.

The only surgeon since the times of Cooper and of Lonsdale who seems to have had a just appreciation of these

## RECURRENCE OF INGUINAL HERNIA.

able steps in the operation for radical cure of hernia, provided the sac is displaced to the safest possible place, which is above the internal ring.

### 6. Cases of hernia treated during childhood.

The treatment of hernia in children by trusses frequently effects a temporary cure, a cure which is followed by a relapse sooner or later, when the strain of adult work begins.

From a consideration of the modes of recurrence the following points appear to be necessary in the operation for hernia: *a.* Transposition of the neck of the sac; *b.* constriction of the internal ring; *c.* strengthening the weak area of the posterior wall of the inguinal canal to the inner side of the internal ring. In the typical Bassini operation this is done by suturing the conjoined tendon to Poupart's ligament; *d.* obtaining adequate pressure upon the internal ring; *e.* strengthening the weak area to the outer side of the internal ring.

In the following operation which I now perform and which has been adopted by my colleagues, the above points are embodied.

The inguinal canal is opened by dividing the external oblique over the canal from the external ring to well above the internal ring.

The coverings of the spermatic cord are lifted with two pairs of forceps and divided between the forceps by a knife the edge of which is lateralized.

The sac is recognized and separated from the constituents of the cord. The neck of the sac is carefully isolated by stripping structure adherent to it by wiping it with dry gauze. The sac is transferred and ligatured as high up as possible, the ligatures are left long and one of the ends is threaded through a needle the point of the needle protected by a finger is passed through the internal ring and brought out through the entire thickness of the abdominal wall, with the exception of the skin about one and a half inches above the internal ring. The other end is treated in the same way and the ends tied together.

adopted by Stimson, the highest contemporary authority on fractures). Fig. 5 is typical; not impacted.

2. Fractures where the neck joins the trochanter, or at the base of the neck. Fig. 6 is typical; impacted. This skiagraph also shows an impacted fracture of the neck at the head, emphasized as frequent by Zachary Cope. The impaction of the neck into the trochanter connotes an incomplete fracture of the trochanter.

3. Fractures through the trochanters, which, as taught by Cooper, are typically comminuted and combined with fracture of the neck at its base.

(a) The *uncomplicated form*, as taught by Cooper, or the *first grade of injury*, as described by Cope, is represented by impacted fracture at the base of the neck, already enumerated (Figs. 6, 8, and 9).

(b) A more advanced grade is represented by partial comminution of the great trochanter (Fig. 9).

(c) The most advanced grade, and what may be regarded as the typical fracture through the trochanters, involves injury of both trochanters, usually with some comminution (Figs. 10, 11, 12, 13, 14, and 15). Figs. 16 and 17 may also be added, though verging on the next type (subtrochanteric).

4. Fractures below the trochanters. Typical of the transverse type is Fig. 7. The oblique type verges into that last described (Figs. 16 and 17).

#### CASES OF TYPICAL FRACTURES OF THE UPPER END OF THE FEMUR.

CASE I.—“*Intracapsular*” Fracture of the Neck (Fig. 5).—Mrs. Ellen G. was a woman aged forty-five years. Her neighbors accused her of being a drinking woman, and of having suffered at times from delirium tremens. One night she imagined she was being pursued, and jumped out of the second story window of her home. Apparently nobody paid much attention to her, as she returned to her room, seemingly unhurt. Later during the same night she jumped a second time out of the second story window, and was so unfortunate this time as to injure her right hip. She was brought to the Episcopal Hospital, and admitted to Dr. Frazier’s service, January 3, 1913.

CONTRACTURE OF THE PSOAS PARVUS MUSCLE  
SIMULATING APPENDICITIS.\*  
BY GEORGE R. WHITE, M.D.,  
OF SAVANNAH, GA.

AMONG the cases operated upon for appendicitis there are a certain number in which the removal of the appendix does not relieve the symptoms, and the patients have no abatement of pain and tenderness in the right iliac fossa after the operation. There are several causes assigned for continuance of the pain, including adhesions, Jackson's veil, ptosis of the colon, and functional neurosis. After some observations, extending over about five years, it is my belief that contractions of this psoas parvus sometimes occur, simulating chronic appendicitis and keeping up trouble after the appendix has been removed.

The first case that called my attention to this condition was a patient of Dr. M. L. Currie, of Vidalia, in his hospital, in November, 1908. The history is briefly as follows:

CASE I.—Mrs. O. P., thirty-eight years, married, no children. Well nourished and not of a neurotic temperament. About a year previously she began to have shooting pains and tenderness in the right iliac fossa, which gradually got worse. Six weeks ago the pain was so great she was obliged to take to her bed, where she has remained. She was not constipated, there were no digestive disturbances, and there was never any fever. Examination showed the four classical symptoms of appendicitis—rigidity of the right abdominal muscles, localized pain, excessive tenderness over McBurney's point, and a distinct tumor in the region of the appendix, which could not be well defined on account of rigidity and excessive tenderness. A diagnosis of appendicitis was made. At operation the appendix was found to be small, soft and apparently normal in every way. The mesentery was

\*Read before the Georgia Medical Association, April 16, 1913.

CASE V.—*Fracture Through the Trochanters of the Femur (Complete)* (Fig. 9).—Thos. A., sixty-five years old, slipped on the icy pavement February 21, 1903. He was brought to the Episcopal Hospital and admitted to the service of Dr. G. G. Davis. There was pain, swelling and crepitus in the region of the great trochanter of the left femur. There was marked eversion of the entire lower extremity. Shortening was not noted.

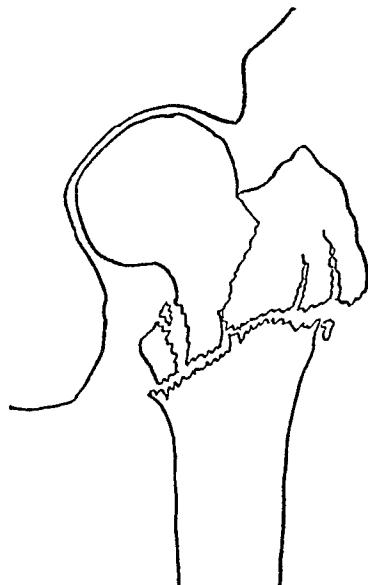
Buck's extension was applied, with a sliding splint to prevent rotation of the lower extremity.

April 7. Weights removed.

April 14. In chair.

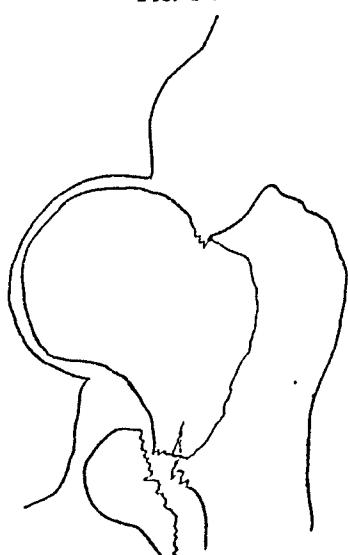
April 23. Discharged, walking on crutches.

FIG. 9.



Case V.—Fracture through trochanters of femur. Impacted fracture of neck at base (February 24, 1903).

FIG. 10.



Case VI.—Fracture at base of neck of femur (impacted); with separation of lesser trochanter (August 9, 1912).

#### FRACTURES INVOLVING THE LESSER TROCHANTER OF THE FEMUR.

CASE VI.—*Fracture of the Lesser Trochanter and Impacted Fracture of the Neck at its Base* (Fig. 10).—James O'R., forty-eight years old, was thrown off the running board of a trolley car ("summer car"). He landed on his left hip. He had severe pain, and was unable to rise. He was lifted from the street, placed on a chair, and removed to the Episcopal Hospital in a patrol wagon. He was admitted August 4, 1912, to the service of Dr. Frazier. There was great pain in the left hip; the

incised, relieving all tension. Immediate relief followed the operation. She went home in about two weeks and was able to get about with some degree of comfort.

August 11, 1911, she returned and the floating kidney was anchored. A letter dated March 27, 1912, states that she was greatly benefited by the operations and is now enjoying good health, and is able to do her work.

In spite of experience with the two cases mentioned above, in the third case, which occurred over a year later, the diagnosis was not made and the symptoms relieved until the third operation had been performed.

CASE III.—October 19, 1911, P. C., fourteen years old, well nourished and not neurotic. In August of this year she began to have shooting pains in the right side, which gradually increased in severity until October 1, when she was confined to bed with a severe pain. There was no constipation, no fever, and no disturbance of digestion.

Examination showed the four classic symptoms of appendicitis; namely, rigidity of the right rectus muscle, localized pain and tenderness in the right iliac fossa, and a tumor. She was operated upon and the appendix removed, but obtained no relief. January 26, 1912, the pain was so great she was again operated upon for adhesions. No adhesions were found and the operation afforded no relief. The pain gradually got worse after the operation, and began shooting down the leg.

March 21, 1912, after several examinations, each showing an indefinite tumor in the right iliac fossa, she was operated upon the third time for contracture of the psoas parvus tendon.

The tendon was exposed retroperitoneally through the usual appendicitis incision, and was found to be very tense, with several bands of fascia running through the psoas magnus. The main and accessory tendons were cut, and all tension relieved.

Relief from pain in the side was prompt. She was able to walk about the room in ten days, and when seen May 1 the side was absolutely free from pain, and she was enjoying good health.

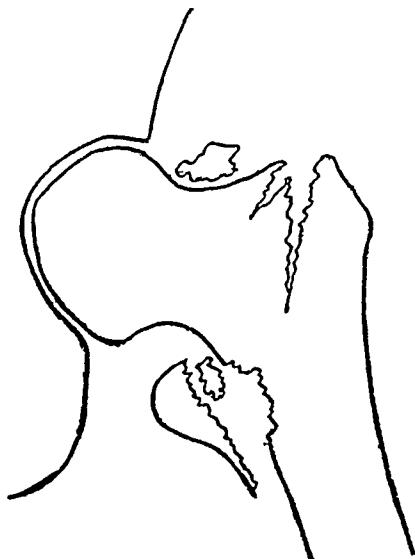
In the fourth case the patient was a neurasthenic and in the absence of any other discoverable cause, the condition might be considered a neurosis.

September 26. Lateral outward traction was also applied. Patient has frequent asthmatic attacks.

October 13. Patient died suddenly (within five minutes), apparently from cerebral embolism.

CASE VIII.—*Fracture of the Lesser Trochanter with Fracture Through the Trochanter* (Fig. 12).—Charles H. M., seventy-four years old, was struck by a falling scaffolding, which he thinks caught him in the back, throwing him on his face. He was picked out of the wreckage in an unconscious condition, and

FIG. II.



Case VII.—Fracture of femur through trochanters, with separation of lesser trochanter  
(September 23, 1912).

brought to the Episcopal Hospital, where he was admitted, December 1, 1912, to the service of Dr. Deaver.

On admission he was conscious, but badly shocked. Vomited several times after admission. There were swelling and spasm of the muscles of the left thigh; the limb was in external rotation; 1 cm. shortening was present; slight crepitus around the hip-joint, with preternatural mobility.

Limb placed between sand-bags and Buck's extension applied. Sand-bag also over thigh to control spasm of muscles.

Patient has used catheter twice daily for four years on account of prostatic obstruction.

December 12. Patient was removed to his home. Subsequent history not known.

### SIMULATING APPENDICITIS.

fossa with neither nausea nor fever. She was seldom entirely free from pain, and at times it became very severe. Examination showed rigidity of the right rectus, tenderness over McBurney's point, and a tumor about the size of a finger.

The operation revealed a small sclerotic appendix with adhesions, which may have been a factor in causing the trouble. The psoas parvus fascia was in a state of contracture, and projected forward into the abdominal cavity, simulating a tumor.

The main and accessory bands of fascia were cut retroperitoneally and all tension relieved. There has been no pain in the side since the operation, though indigestion and neuralgic attacks continue.

**CASE VI.**—June 12, 1912, A. W., forty-two years. The patient has had rheumatic pains in various parts of the body the past year. For the past month the right side of the abdomen has been painful and tender, with pain increased by movement, stipated and had severe vomiting spells.

Examination showed rigidity of the right abdominal muscles, tenderness over McBurney's point, and rigidity of the psoas parvus muscle. The muscle in the left iliac fossa was rigid but to a lesser extent.

At operation the appendix was found in a normal condition. The right psoas parvus was in a state of tense contracture and was incised, relieving all tension. The patient was relieved from pain immediately, and was able to return home in two weeks.

**CASE VII.**—Sept. 11, 1912, M. J., twenty-six years. The patient has had a pain in the right side for about eight months, sometimes quite severe. Two weeks ago she had an attack which confined her to bed. She is now feeling better, but the right side is painful and tender.

She is not neurotic and there have been no digestive disturbances and no fever. Examination showed a floating kidney. The abdominal muscles were relaxed and a tense band felt in the right iliac fossa.

The kidney was anchored, the appendix was removed, though it was apparently normal, and the psoas parvus tendon cut.

She made an uneventful recovery, and went home in two weeks.

June, 1913. Walks with only moderate limp and very little disability. Has been home 3 months.

CASE X.—*Fracture of the Lesser Trochanter with Fracture Through the Trochanters* (Fig. 14).—John S., fifty-nine years old, fell from a ladder, a distance of about 9 feet, striking on his right hip. He was unable to rise without help, and has been unable to move his right leg since the accident. He was brought by patrol wagon at once to the Episcopal Hospital, and was admitted, January 18, 1913, to Dr. Frazier's service. The right lower extremity was in outward rotation, and the patient was unable to rotate it inward. There was 2.5 cm. shortening. Swelling and tenderness around the hip were marked, and there were crepitus and deformity of the upper end of the femur.

Buck's extension was applied.

January 19. The limb was placed in flexed position on an inclined plane. Skiagraph in this position showed more deformity.

January 22. Patient was etherized, and Dr. Ashhurst applied a plaster-of-Paris casing, with the limb in full abduction. Skiagraph through case showed some improvement in position.

March 5. Plaster case removed, after being on for six weeks. Good union. Shortening 3 cm. (Fig. 15). Flexion to 110°, abduction to 20°, good rotation.

CASE XI.—*Fracture of Lesser Trochanter, with Comminuted Fracture Below Trochanters, and Splitting Fracture Through Greater Trochanter* (Fig. 16). John S., thirty-four years old was a bridge-worker. On the morning of August 13, 1912, at 8 o'clock, while at work on a bridge, he lost his balance and fell 30 feet to the ground. As he landed he struck his right thigh upon a beam. He had very severe pain and was unable to rise. He was carried into a neighboring house, and was brought thence by the ambulance, being admitted to the Episcopal Hospital, in Dr. Frazier's service, at 8.30 A.M. There was no shock. Above the middle of the right femur there was deformity, crepitus and preternatural mobility. Fracture of femur, seemingly oblique, with some overlapping of fragments. The limb was in outward rotation. The shortening was 4 cm.

Buck's extension was applied, with Volkmann's sliding foot-piece to prevent rotation of the limb; 15 pounds weight.

August 14. Entire thigh is extremely swollen; skin is tense and marked tenderness is present. Ice locally.

apparent tumor were present in all cases. The pain came on suddenly in two, gradually in five; it was limited to the side of the abdomen in five, and was referred to the leg in two. Four with extreme tenderness showed rigidity of the abdominal muscles on the right side, but this was probably a voluntary act. Fever was not present in any case, and the digestive disturbances seen in two of the patients were probably coincidents and had no relation to the trouble. One of the patients was markedly neurasthenic, the other six were not.

The differential diagnosis from appendicitis is difficult or impossible in cases of short duration, with the four classic symptoms of appendicitis present.

Long-continued severe pain in the right iliac fossa with a marked tumor, but without fever and without digestive disturbances, would indicate trouble other than appendicitis. However, it is not essential that the diagnosis should be made before operation, provided the condition is recognized, if present, as soon as the abdomen is opened. The presence of a tense tendon along the edge of the psoas magnus renders diagnosis easy through an exploratory incision.

The treatment consists in cutting of the tendon and all tense bands, which may be done either transperitoneally or retroperitoneally, preferably the latter, since by working retroperitoneally the peritoneum serves as a retractor in keeping the intestines out of the way. The glistening tendinous fascia may be picked up with a clamp and cut, also all tense bands of accessory tendons. The common iliac artery is well out of the way inside of the tendon, and the nerves are beneath the large muscle, and to the outer side, so no important structures are liable to be injured.

The results of the operation have been entirely satisfactory thus far, the relief being immediate and lasting.

## SIMULTANEOUS FRACTURE OF BOTH PATELLÆ,\*

WITH REPORT OF TWO CASES AND A REVIEW OF THE LITERATURE.

BY CARL ROSSOW STEINKE, M.D.,  
OF PHILADELPHIA.

SIMULTANEOUS fracture of both patellæ is not a common occurrence, and consequently each man's personal experience with such is limited. Corner,<sup>1</sup> in a report of 504 cases of fractured patellæ, found only 1 per cent. bilateral, but does not state how many of these were simultaneous. Georg Müller<sup>2</sup> in reviewing 1000 fractures had 13 fractures of the patellæ, none of which were simultaneous. Heineck<sup>3</sup> collected 1100 cases of fractured patellæ, all treated by the open operative method over a period of ten years, with only 10 simultaneous cases. Chaput<sup>4</sup> in reporting a case of simultaneous fracture of both patellæ says, "The interest here is in the rarity of simultaneous fracture of the patellæ."

In a letter from Dr. William J. Mayo he says, "So far as I know, we have never had a case of simultaneous fracture of both patellæ."

Considering the rarity of this condition, I thought it would be of interest to collect the cases recorded in the literature. In every case the original report has been consulted, unless otherwise stated, so that the cases are authentic and the data correct.

The mode of fracture may be from direct violence, or indirect as by muscular contraction, or a combination of the two.

The type of fracture in simultaneous cases may be, as in fractures of a single patella, transverse, longitudinal, oblique, stellate, comminuted, compound, or any of these in combination, depending upon the manner and severity of the injury causing the same.

The injury occurs more frequently in men than in women.

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\* Read before the Philadelphia Academy of Surgery, April 7, 1913.

## REDUCTION OF FRACTURE OF LONG BONES.

direct interaction between the fragments themselves. In principle the apparatus was similar to Gerster's turnbuckle. At first it was arranged that one end of the extension screw should pass through a hole bored centrally through the joint of one of the bone-holding forceps, while the other end passed either through a similar hole in the other, or in front of or behind this hole according to the relative positions of the fragments; but it was found that this arrangement, though readily causing the separation of the fragments, failed in affording easy alignment and coaptation. I am much indebted to Mr. H. W. M. Gray for having tried the instrument at this stage in one of his cases on Jan. 24, 1912. This instrument was also shown at the meeting of the British Medical Association, held at Liverpool in 1912. The instrument was then modified in such a way that the sliding piece on one end presented a slot in which the bone-holding forceps could slide, but again the comparative fixity of the other end rendered adjustment both of the fragments and of the instrument difficult, because the forces in operation are considerable. The instrument was again modified so that a slot was formed in each end piece and each was provided with a hasp so that the bone-holding forceps could be shut into the slot without the risk of its coming out during the progress of extension. This instrument (Fig. 1) is applied in a similar manner to Gerster's, that is to say, extension is carried out as far as possible by ordinary means without using undue force and the fragments are seized with Lane's bone-holding forceps applied parallel to each other and as near together as possible. The pieces on the screw are then adjusted equally from the middle to fit the distance between the forceps and the instrument is lowered over the forceps so that the slots engage them and the hasps are closed up. The handles of the forceps are held one in each hand by an assistant and the screw is turned by the operator until the full extension has been produced. Coaptation being thus secured is maintained, if necessary, by using a third bone-holding forceps to grasp the fragments. At this stage it

was made from the internal condyle of the femur upward to just above the upper border of the patella, and down to the external condyle of the right femur. The flap was dissected back to expose the fragments, and the joint opened; the blood clot, of which there was a moderate amount, was removed. The edges of the torn aponeurosis were found between the fragments. The end of the fragments were cleaned. A hole was drilled from the anterosuperior surface of the upper fragment, and from the anteroinferior surface of the lower fragment, the drill emerging at corresponding points on the posterior of each fractured surface. A No. 18 silver wire was run through the drilled holes, the synovial membrane and aponeurosis, with the capsule were then sutured with chromic catgut and the wire twisted to bring the fragments in apposition. The skin was sutured with interrupted silkworm gut. The same procedure was followed on the left leg, posterior splints applied, and the patient put to bed with the legs elevated.

There was an evening rise of temperature to 100.4° each day, and on November 28 slight swelling and redness were noted about the right knee. The joint was aspirated, withdrawing 20 c.c. of slightly turbid fluid, and the same amount of a 2 per cent. formalin in glycerine solution injected. No bacterial growth was obtained from the fluid removed. There was considerable pain in the knee for the remainder of the day. His temperature remained practically normal after two days. All swelling and redness disappeared, so that on December 8, plaster-of-Paris casts were applied. The patient was out of bed the tenth day and walked with the aid of crutches on the 23d. The casts were removed on December 31, and the patient was discharged on January 4, 1913, just six weeks after the operation.

In a letter from him dated March 25, 1913, about four months after the operation, he writes as follows: "I used the crutches only four days after leaving the hospital and carry a cane on the street merely as a precaution. I have no difficulty in stepping upon and down from curbs, but find it rather hard to go up an incline. However, on the level, I walk very naturally, and have the power to extend my legs from the bent position. It is not necessary for me to lie down and rest as I did at first, since my strength is increasing daily. Sitting on the edge of a table I can bend my right knee 90° and the left about 75°."

## FEMUR TROCHANTER FRACTURES.

this served only to render the comprehension of the subject more difficult for the student.

Amesbury, under the general heading, "Fracture of the Trochanter Major," says: "Occasionally, fractures of the neck of the bone and the trochanter pass through the femur, so as to divide the neck of the bone and the trochanter from the shaft, these two parts remaining naturally connected. In these cases, the fracture is situated between the trochanter minor and the lower part of the root of the neck, sometimes taking one direction, and sometimes another." He quotes a case from Guthrie (*Med.-Chir. Trans.*, vol. xiii) in which autopsy showed, as the result of a heavy fall on the hip, a fracture external to the capsule; the little trochanter was broken

FIG. 1.

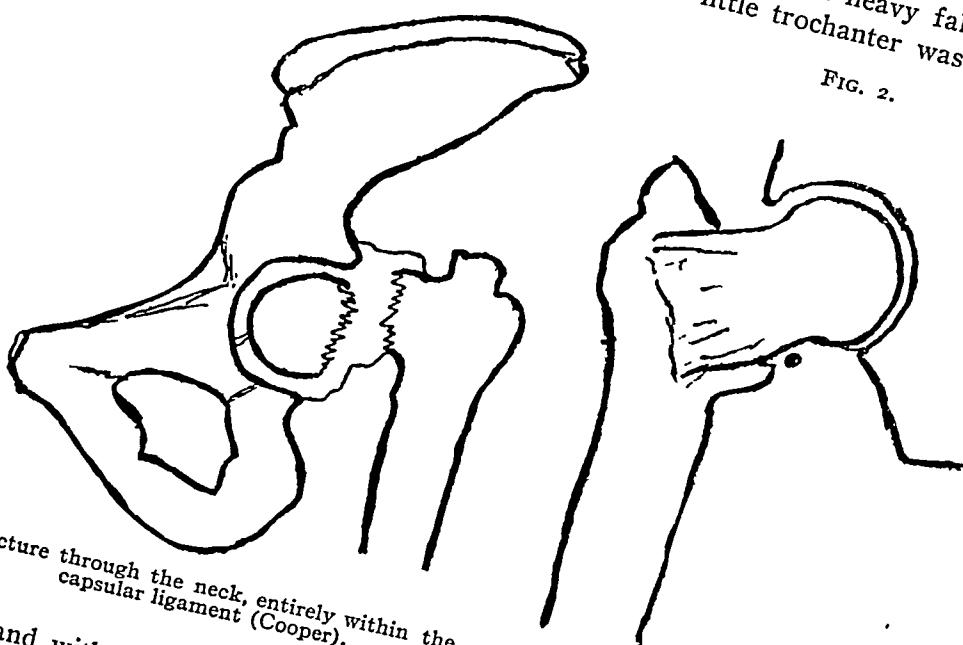


FIG. 2.

Fracture through the neck, entirely within the capsular ligament (Cooper).

Fracture through the neck of the trochanter major at its junction with the thigh bone (Cooper).

off and with it the attachment of the psoas and iliacus. The head and neck were separated from the shaft by a diagonal fracture, extending from the upper and outer part of the trochanter major to the trochanter minor, so as to leave the insertions of the pyriformis, gemellus, obturator externus and internus, and quadratus, with the head and neck. He also quotes a case of Syme (*Edinb. Med. and Surg. Jour.*, vol. xxv) in which post-mortem examination showed the capsular ligament entire, but two fractures beyond—one detaching the neck where beginning to spring from the shaft, the other running obliquely downward and inward through the trochanters, so as to detach the posterior part of the greater and the whole of the lesser trochanter in one piece from the body of the bone.

Lonsdale describes fractures of the great trochanter thus: "The direction the fracture takes varies very much; it most frequently, however, extends so as to include a portion of the neck of the bone and of

The following is a summary of the cases of simultaneous fracture of both patellæ found in the literature:

Back in 1817 Desault<sup>6</sup> writes of a case as follows: "A man in the Hotel Dieu fractured the rotula of each knee, in the operating room, by means of convulsive motions, produced by the operation of lithotomy." There are no other facts mentioned.

Sir Astley Cooper<sup>7</sup> writes of a case as follows: "A young woman was brought into my house in her father's arms and he said, 'I am obliged to carry her for she has lost the use of her legs, having broken her knee-pans eight months ago, and she has never been able to use her limbs since.' Passive motion was directed, and she was ordered to try and extend her legs after they had been bent by the surgeon. At first she could effect but little; however, by repeated trials she gradually recovered the use of her limbs."

In one of the Guy's Hospital Reports<sup>8</sup> the following case is recorded: A man suddenly thrown forward, in trying to save himself from a fall, heard his knees crack, and he fell to the ground. Four days later he was taken to the hospital, where the patellæ were strapped. Straight splints were applied and the legs elevated. Three days later the left patellar fragments were in apposition, while the right showed one inch separation.

Sir Astley Cooper saw him and the treatment pleased him. On the twelfth day the patient is reported as "going on perfectly well." No other notes were obtainable concerning this case.

Tufnell<sup>9</sup> tells of a woman, thirty-nine years old, who slipped in running down stairs, made a violent effort to catch herself, but fell forward striking her left knee on one of the steps. Examination showed the left patella to be fractured in a stellate manner and the right transversely, being torn across by muscular violence. She was treated by means of bandages and posterior splints. Passive motion was started after seven weeks and on the fifteenth week the patient left the hospital without the slightest tendency to lameness. Union was apparently osseous in the stellate fracture, while that of the transverse was by a ligamentous band.

R. Johnston<sup>10</sup> relates the case of a woman, thirty-three years old, who tripped, heard a crack and felt something give way. She fell and was unable to get up. Both knees were found to be swollen. Three days later the right was put up after the method devised by Dr. Sanborn,<sup>11</sup> and the left after Sir Astley Cooper's<sup>12</sup> method. Eighteen days later there was bony union in the right patella, but the left had a separation of one-quarter inch and ligamentous tissue between the fragments. Patient was discharged in about six weeks. No further notes were obtainable.

Godfrey<sup>13</sup> records the case of a man, who, in mistaking the lower step in coming down stairs, fractured both patellæ transversely. After many months he obtained free use of the knees and recovered without a limp.

Wendover<sup>14</sup> tells of a man slipping and bringing unusual strain on the left leg, with the resulting fracture of the patella. In bringing the right leg into play to save himself the right patella was broken. Both

## FEMUR TROCHANTER FRACTURES.

Hamilton made the explicit statement, when describing extracapsular fractures, that "almost invariably the acetabular penetrates the trochanteric fragment in such a manner as to split the latter into two or more pieces."

Cotton is rather diffuse when writing of "Fractures Through the Trochanters." He adopts a pathogenetical classification of the leg. "The lesions in the torsion fractures often show a combination of a torsion fracture (with spiral lines) through the femur and the intertrochanteric line. Breaks directly across," he adds, "between the neck of the greater and lesser trochanters are rare; they are from direct violence usually. Such lesion may accompany a break at the base of the neck, perhaps from splitting of the trochanteric neck by this basal fragment." Torsion fractures, he says, may break the bone above or below the lesser trochanter, but these fractures clinically belong with those wholly below the trochanters. Speaking in a footnote of fractures do not anatomically fall either in this class or in class 5" (fractures through the trochanters). He says (p. 488) fractures of the lesser trochanter often occur as a complication of spiral or splintering fractures.

Stimson prefers the terms "fracture through the neck" and "fracture at the base of the neck" to describe the "intracapsular" and "extracapsular" fractures; for the former he also uses Kocher's term "fractura subcapitalis," but thinks the term "fractura intertrochanterica" is not acceptable for the latter. For Kocher's term "fractura per-trochanterica" Stimson uses the term "fracture through the great trochanter and neck." Of fracture at the base of the neck Stimson writes (p. 360): "The line of fracture follows ordinarily the junction of the neck and shaft quite closely—that is, it coincides with the spiral line in front and the intertrochanteric line behind as they pass between the great and lesser trochanters. It may extend downward and detach the lesser trochanter from the shaft, leaving it attached to the neck, or go even lower and separate a part of the shaft. . . . In the majority of cases other lines of fracture traverse one or both trochanters, splitting off one or two pieces, usually from the posterior surface of the great trochanter, or completely minuting it completely."

In discussing fractures through the great trochanter and neck (fractura per-trochanterica of Kocher), Stimson says it is an uncommon injury, and that few specimens are known; he has seen only one case himself, and there the fracture was *atypical*. In typical cases, he says, the "upper fragment is formed by the head, neck, and upper part of the great trochanter." He thinks the mechanism probably is forcible extension or abduction, with avulsion of the shaft from the upper fragment which is held by the Y-ligament. (This is what Ross would call a "sprain-fracture," because the fragment is torn off by ligamentous action.)

Stimson says there are 12 cases on record of isolated fracture of the lesser trochanter; as 9 of these have been reported since 1908, and were recognized by skiagraphy, it is probably more common than formerly thought.

verse fracture of both patellæ. Treated by means of inclined plane, adhesive, and rollers saturated with flour paste. Dressings were removed on the thirty-seventh day and not re-applied. Both patellæ were united by ligaments of about  $\frac{1}{2}$  inch.

Beauvias<sup>19</sup> writes of a man, thirty years old, who in playing leap-frog, was about to spring forward after striking the ground with his feet, when he heard a crackling sound and felt as though he had received a blow on the legs. He fell to the ground and was carried to the hospital, where a transverse fracture of each patella was found. The fragments were not separated more than two centimetres.

Desquin<sup>20</sup> writes of a man of twenty-eight years, who made a jump to a trapeze, missed, and fell to the floor. Transverse fracture of both rotulas with separation of the fragments about three to four centimetres. He was treated by pasteboard splints and bandages. After one month the fragments were united by one centimetre of fibrous callous. The legs were dressed in extension with starch bandages. During the third month all dressings were removed and passive motion begun with massage. Final result was good.

Moullin<sup>21</sup> knew of a man, who in the first stride of a race, was conscious of something giving way in the knee, and in an effort to save himself from a fall, the other patella also snapped.

T. A. Smith<sup>22</sup> records a man, forty-five years old, who slipped on the ice and felt the right knee-cap snap. He got to the elevated, and in taking a seat, the left one snapped, causing him to fall. Twelve days later the patellæ were wired. On the thirty-second day he walked about the ward without crutches or cane, and in five days more he had ninety degrees flexion of the right and seventy degrees of the left knee. On the thirty-ninth day the fragments of the left were separated one-half inch and these were re-wired two days later, finding the first wire had broken. No final result was given. From the history of this case it would seem the left patella must have been broken at the same time as the right, but did not give completely away until he started to sit down. For this reason it is classed with this series.

Chaput<sup>23</sup> relates a case of simultaneous fracture of both knee-pans in a woman thirty-five years old. The fragments were wired and the prepatellar periosteum sutured with catgut. Further reference of this case is made by Lafourcade,<sup>24</sup> in saying that massage of the muscles was begun on the tenth day and of the joint on the seventeenth day, as well as passive motion. Two months later she could walk without crutches. There was flexion to a right angle in both knees at six months.

Warbasse<sup>25</sup> tells of 2 cases in which both patellæ of each were operated upon by the suture method, the bones having been fractured transversely near their middle. Good results were obtained.

Scudder<sup>26</sup> reports a man of forty-four years, who fell from a second story window to the sidewalk, causing comminuted fracture of both knee-caps, the right being compound. At operation all the left patella was removed, as it was broken into many small pieces. The right had three fragments sutured together with silk and other small fragments were removed. Posterior and side splints were then put on for one

## FEMUR TROCHANTER FRACTURES.

fractures through the trochanters is V. Zachary Cope. He has recently written a most valuable article on "Impacted Fractures Through and Near the Femoral Neck." He insists on the frequency of impacted fracture of the neck at the head, from violence directly applied over the great trochanter; and on the frequency of impacted fracture through the base of the neck and the trochanteric region, which, as he says, "includes all those which used to be loosely called 'extra-capsular fractures of the neck.'" He says: "The cancellous tissue of the great trochanter is split up by a firm wedge of bony tissue belonging to the cervix femoris. This wedging of the cervix into the trochanter region is responsible for two or three secondary fractures which frequently complicate the primary breakage."

Cope describes three grades of injury:

(1) A primary fracture occurs at the junction of the head and neck, and the base of the neck is then thrust into the cancellous tissue of the great trochanter, with secondary but incomplete fracture through the great trochanter.

(2) The firm tissue of the neck causes separation of the fragments of the trochanter along the lines previously mentioned. The tip of the great trochanter nearly always is drawn inward toward the upper rim of the acetabulum. This grade of injury he considers to be the most common type of fracture resulting from a fall on the hip.

(3) A further stage, when the small trochanter and a slice of the shaft are also split off.

He concludes that fracture of the base of the neck is always primarily impacted; and if the force applied is great, there are always secondary fractures, both vertical and horizontal, through the trochanteric region.

The conclusion of the whole matter, as it seems to me, brings us back to the classification of fractures of the upper end of the femur originally formulated by that greatest of teachers of surgery, Sir Astley Cooper. His facilities for observing the actual lines of fracture were confined to the post-mortem table; and zealously did he employ his opportunities. Our facilities, thanks to skiagraphy, are unlimited. But all that we have since learned merely confirms the justness and accuracy of his original observations. The typical fractures of the upper end of the femur are:

1. Fractures through the neck (Sir Astley's own term,

## CARL ROSSOW STEINKE.

## TABULATED SUMMARY.

No.	Sex.	Age.	Manner of fracture.	Type of fracture.	Mode of treatment.	Result.
1	Male . . .	36	Indirect	Transverse	Wiring and casts	Good result 4 months after. Flexion: Right knee 90°; left about 70°. Walked naturally on the level.
2	Male . . .	56	Indirect	Transverse	Suturing	Good result 4 months after. Flexion to right angle. Walks O. K.
3 <sup>a</sup>	Male . . .	...	Indirect	...	Old fracture. Passive motion and exercise Splints and strapping	Full recovery of limbs.
4 <sup>b</sup>	Female . . .	...	Indirect	...	...	Third day: left in position; right, 1 inch separation of fragments. No other notes. No tendency to lame- ness.
5	Male . . .	...	Indirect	...	...	Good result. Eighteen days, bony union in right. Separation of $\frac{1}{4}$ inch in left and ligamentous tissue between frag- ments.
6	Female . . .	39	Right indirect. Left direct	Right transverse. Left stellate	Bandages and splints. Passive motion in 7 weeks Straps and splints	Good result. After many months recovered without a limp.
7 <sup>c</sup>	Female . . .	33	Indirect	...	...	...
8 <sup>d</sup>	Male . . .	...	Probably indirect	Transverse	...	...
9 <sup>e</sup>	Male . . .	38	Indirect	Transverse	...	Ligamentous union $\frac{1}{4}$ - $\frac{1}{2}$ inch. Diffi- culty in walking up and down stairs. On the level, O. K.
10 <sup>f</sup>	Female . . .	38	Indirect	Transverse	...	Imperfect recovery.
11 <sup>g</sup>	Female . . .	44	Indirect	...	...	Fibrous union in both. One inch separation in right; $\frac{3}{4}$ inches in left. Greatest difficulty in flexion.
12 <sup>h</sup>	Male . . .	44	Direct	Transverse	...	Good functional action 7 months later.
13 <sup>i</sup>	Male . . .	41	Indirect and direct	Transverse	Wiring	...



## TABULATED SUMMARY.—Continued.

No.	Sex.	Age.	Manner of fracture.	Type of fracture.	Mode of treatment.	Result.
33 <sup>36</sup>	Female...	30	Indirect	Transverse	Wiring	Firm union resulted.
34 <sup>37</sup>	Male...	31	Probably direct	Transverse	Sutured with chromic catgut	Good result. Legs as good as ever.
35 <sup>38</sup>	Male...	30	Direct	Transverse	Posterior splints and casts.	Bend to right angle.
36 <sup>39</sup>	Male...	..	.....	.....	Wired later	Good result after wiring.
37 <sup>39</sup>	Female...	..	.....	.....	One sutured.	Other non-operative.
38 <sup>39</sup>	Female...	..	.....	.....	One sutured.	Good results.
39 <sup>39</sup>	Male...	41	.....	.....	One sutured.	Good results.
40 <sup>41</sup>	Male...	65	Indirect	.....	One sutured.	Good results.
41	Female...	35	Indirect	.....	Wiring	Good results after four years.
42 <sup>42</sup>	.....	.....	.....	Transverse	Right wired. Left looped with silk (braided)	Fine results.
43 <sup>43</sup>	.....	.....	.....	.....	Patellæ looped	Good results. Primary union with perfect knee-joints.
44 <sup>40</sup>	Female...	37	Probably indirect	.....	Wiring	Good result 15 months later.

limb was everted, and inversion gave excruciating pain. He was unable to invert his leg voluntarily. There was 2 cm. shortening, and the left trochanter was about 2 cm. higher than the right.

Buck's extension and sand-bags were applied.

August 8. Shortening was 2.5 cm. A Volkmann's sliding splint was applied to the foot, to prevent rotation, and outward lateral traction (6 lbs.) was applied to the upper portion of the thigh, with the longitudinal traction increased to 15 pounds weight. The patient was allowed to sit up in bed.

August 20. Lateral traction discontinued.

August 24. Weight on longitudinal traction gradually diminished.

August 28. All weights off. Every morning since first week thigh has been flexed and slightly rotated, while traction was maintained.

August 29. Massage ordered.

September 9. Shortening 1 cm. Active flexion of hip to  $135^{\circ}$ .

October 5. Discharged.

March 17, 1913. Returns for examination. There is a moderate limp, and patient complains of pain and stiffness in joint. He has done no work since his accident. But it should be noted that he has not yet secured an award of damages for his injury. There is 1 cm. shortening; flexion of the hip is possible to  $75^{\circ}$  ( $15^{\circ}$  more than a right angle), abduction only to  $8^{\circ}$ , while rotation is normal.

CASE VII.—*Fracture of the Lesser Trochanter, with Partial Fracture of the Neck at Base (Fig. 11).*—Amelia L., seventy-two years of age, tripped over the carpet as she walked across her room, and fell heavily, striking her left hip on the floor. She was unable to move, and was not moved until taken to the Episcopal Hospital in the ambulance. She was admitted September 12, 1912, to Dr. Deaver's service. On admission she was lying on her right side, with thighs flexed, and seemed comfortable in that position. When she was turned on her back, the left hip and knee were flexed, and the left lower extremity rotated outward. It could be rotated inward, but this caused moderate pain. When the limb was fully straightened it appeared to be shorter than the right.

Buck's extension was applied, with longitudinal traction, and sand-bags.

divided, the fibrous tissue between the fragments dissected away, and the bony surfaces freshened. The fragments were then wired. Four years later the gaps in the quadriceps tendons were partially filled in and the power of extension was good.

Barcus<sup>40</sup> relates the case of a woman of thirty-seven years, who fractured the right patella and had it wired. About six months later she slipped, fractured the left patella and re-fractured the right. Both were wired and a good result was reported fifteen months later.

Nassau,<sup>41</sup> at a meeting of this Society, January 8, 1912, reported a case in a man sixty-five years of age, who slipped and fractured both knee-pans. Under local anaesthesia the right was wired and the left treated by running braided silk around its fragments. A fine result followed.

Robert T. Morris, in a letter to the writer, tells of a case he had two years ago. He was called by Thomas Byrne to see a woman of about thirty-five years, who in stooping suddenly to pick something from the gutter, fractured both knee-pans transversely, one through the middle and the other through the lower third. After six days he operated through a transverse incision, freeing the inturned fibroid capsule and suturing the patellæ after the Blake method, *i.e.*, "encircling the entire patella with a strand of kangaroo tendon, which brings the fragments into position, when it is tied." There was primary union, with practically perfect knee-joints to date.

Malgaigne<sup>42</sup> states that Camper and Sée each saw a case of simultaneous fracture of both patellæ, but gives no further information.

In summarizing the above cases, I find there are 44. Age was mentioned in 25, ranging from 15 to 65, with an average of 36.6 years. Sex was stated in 39 cases, 23 (59 per cent.) being males and 16 (41 per cent.) females. The manner of fracture is mentioned in 28 cases or 56 patellæ. Thirty-five (62.6 per cent.) of these were fractured in an indirect manner, 19 (33.9 per cent.) by direct violence, and 2 (3.5 per cent.) by a combination of the direct and indirect. The type of fracture is recorded concerning 44 patellæ. Thirty-nine (88.6 + per cent.) were transverse, 3 (6.8 + per cent.) comminuted, 1 (2.2 + per cent.) compound comminuted and 1 (2.2 + per cent.) stellate. Of the transverse type, 19 (48.7 per cent.) were by the indirect manner, 9 (23.1 + per cent.) by direct violence, 2 (5.1 + per cent.) by combination of the two above, and in 9 (23.1 per cent.) cases no statement is made as to the type of fracture.

Of the 68 patellæ (34 cases) concerning which the mode of treatment was mentioned, 17 (25 per cent.) were not

CASE IX.—*Fracture of the Lesser Trochanter and Fracture Through the Trochanters* (Fig. 13).—Mary D. was forty-six years old. She was crossing the street with the week's wash in her arms, when her foot struck a brick in the pavement. She fell, striking her right hip against the curb-stone. She had just had “two glasses” of beer, but nevertheless she fainted. On admission to the Episcopal Hospital, Dr. Frazier’s service, January 9, 1913, the beer had begun to do its work, as she was slightly intoxicated. The right lower extremity was everted, and inversion

FIG. 12.

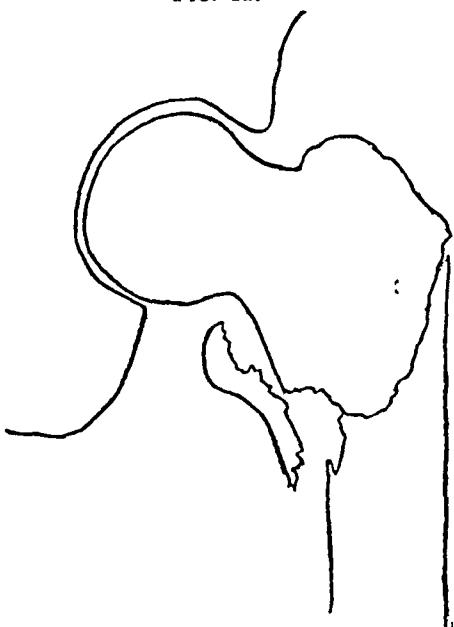
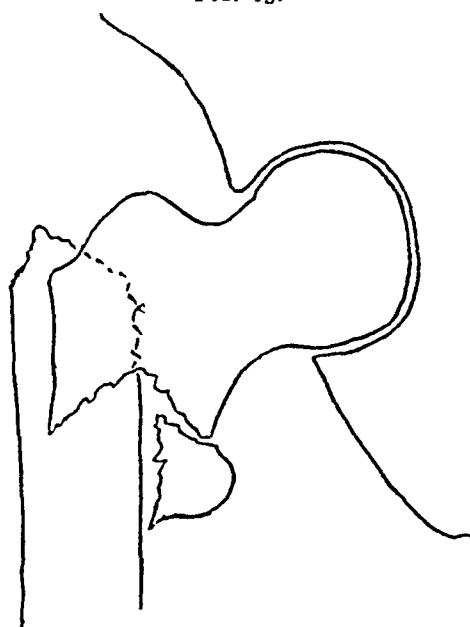


FIG. 13.



Case VIII.—Fracture of femur through trochanters, with separation of lesser trochanter (December 3, 1912).

Case IX.—Fracture of femur through trochanters, with separation of lesser trochanter (January 10, 1913).

or any other motion caused pain. There was fulness in the upper third of the thigh, with ecchymosis laterally just below the loin. There was 2 cm. shortening, and the great trochanter was higher than that on the left. (According to the X-ray the fracture is below the great trochanter, so the upper end of the shaft must have been mistaken for the great trochanter.)

Buck’s extension and sand-bags were applied, with the thigh in abduction.

From January 10 to 15 the patient was on the verge of delirium tremens.

January 16. Mental state much improved.

February 24. Shortening only 1 cm.

March 12. Walking well with crutches.

Andrews<sup>44</sup> speaks of wiring as follows: "The old-fashioned term, 'wiring the patella,' is a misnomer and obsolete, so far as my own practice goes. The patella union is only an incident in the ligamentous and tendinous repair by suture."

In another article<sup>45</sup> he advocates imbricating the free disfringes of periosteum and fibrous tissue.

Finally, we observe that simultaneous fracture of both patellæ is a rare condition, occurring in less than 1 per cent. of all cases of fractured patellæ, and that a poor functional result may be expected unless the patient is given the advantage of an open operation where there is enough separation of the fragments, providing asepsis is carried out and the operator is one of ability.

NOTE.—Since preparing this paper a letter has been received from Dr. W. L. Munro, of Providence, R. I., relating the following case of his:

J. L., age thirty-five. On July 5, 1909, a person standing behind the patient struck both knees with his own knees, causing sudden flexion. He tried to recover himself when he "felt something snap" and fell to the ground with fracture of both patellæ.

*Operation.*—Longitudinal incisions 3 inches, fringe removed, joint irrigated with saline. Edges of the capsule and periosteum, together with lateral reflexion of extensor tendons united with No. I chromic, reinforced by mattress suture No. 3 chromic from the ligament to tendon.

July 20: Plasters cut down and stitches removed. Skin healed perfectly. Excellent result in both patellæ. Line of fracture cannot be felt. Passive motion begun. Considerable stiffness of joints.

July 25: Patient allowed upon crutches. Passive motion continued. Joints limbering up.

July 30: Freedom of motion increasing. Walks with crutches without difficulty.

Aug 2: Discharged.

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<sup>3</sup> Heineck: Surg., Gynec. and Obst., Chicago, 1909, ix, 177-248.

<sup>4</sup> Chaput: La Semaine Méd., Paris, 1897, xvii, 199.

<sup>5</sup> Piersol: Human Anatomy, 1907, p. 400.

<sup>6</sup> Desault, P. J.: Treatise on Fractures, Luxations and Other Affections of the Bones. Translated by Chas. Caldwell, 1817. 3d edition, p. 299.



## UNCOMPLICATED FRACTURES OF THE TARSAL SCAPHOID.\*

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It is only very recently that fractures of the carpal scaphoid have been prominently brought to our notice, but that of the tarsal is still unnoticed. This paper is therefore merely a plea for the recognition of a fracture which is really of importance and which should be more studied. The vague term "sprain" of the ankle should really have no place in our vocabulary. Any condition deviating from the normal has a definite underlying pathological basis. The old expression "sprain of the back" has happily been discarded, thanks to Goldthwait. The terms "lumbago," "sciatica," and a few others have likewise met their fate. It is now time that the term "sprain of the ankle" should also go, and that in every injury to the foot or ankle a definite diagnosis should be made. Very frequently a weak foot in later life can the more readily be understood and the more rationally treated if its etiology has been properly determined. An injury such as is to be described in this paper is very frequently followed by a weak or flat foot. The ordinary treatment for flat foot, if carried out in this line of cases, is positively injurious. This will be shown later.

Very little attention has thus far been paid by writers to simple uncomplicated fractures of the tarsal scaphoid. Most of the important text-books on fractures ignore it entirely, while one or two merely mention that it is occasionally seen. Where the subject is mentioned the statement is made that it is a very rare condition, rarely seen except in combination with fractures of other bones of the foot, and due to a severe crushing injury.

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\* Read before the Medical Society of the City Hospital Alumni.

According to Piersol,<sup>5</sup> "The bone is not fully formed until after puberty, perhaps, not before eighteen." Consequently such an injury is not likely to occur in the young. Nor would it be expected in the aged, for the reason that the fracture of one knee-cap is uncommon in elderly people.

The following cases were operated on by Dr. Charles H. Frazier, and I am indebted to him for allowing me to report the cases at this time.

CASE I.—H. G., male, age thirty-six. Family and personal history negative. On November 18, 1912, in mounting his horse, the patient's foot slipped from the stirrup, and in attempting to regain the stirrup, both knees were thrown together and pushed violently against the horse. The horse kicked back in some peculiar manner, and, according to the patient's story, struck both knees with the one blow. He was unable to rise and fell to the ground with absolute loss of function of both legs. He was brought to the Episcopal Hospital the next day. Examination revealed a well developed and well nourished white male, with nothing in his general condition worthy of note, except perhaps, for patches of psoriasis about the elbows on the extensor surfaces, scattered areas on the back, legs, and over the forehead.

In examining the lower extremities the legs were found to be extended on the thighs as he lay in the dorsal position, and both patellæ showed transverse fractures with marked separation of the fragments. The fracture of the patellæ passed through about the junction of the upper with the lower third. Extreme tenderness was noted at the point of fracture and there was marked swelling about both knees. There was complete loss of function of the knee-joints. No marks of contusion from a kick were to be found, therefore the fractures were thought to be caused by muscular contraction.

*Operation* (November 22, 1912).—The fields of operation were shaved, scrubbed with green soap, sterile water and alcohol, and a dry fluff dressing applied the night before operation. The same process, omitting the shaving, was repeated the morning of operation. Just before the incisions were made official tincture of iodine was applied to the parts. A curved incision

the scaphoid is not elicited and is not part of the symptom-complex. The pain across the instep found in flat foot is here also present. Its etiology, the depression of the arch and consequent stretching of the mid-tarsal ligaments, being the same. No tenderness, however, is seen over the tubercle of the calcis, the point of attachment of the plantar fascia, a condition usually noted in an ordinary weak or flat foot. The pain frequently extends up the limb, following the tibialis posticus, whose attachment to the scaphoid has been severed. The antagonistic peronei are now permitted unhindered to contract and abduct the foot. This tonic contraction of the peronei finally leads to a chronic irritation, and a rigidity of the foot in valgus results, comparable to the non-traumatic rigid valgus. In this traumatic case the point of differentiation lies in the tenderness on the inner side of the foot, both muscular and osseous.

Motions of the foot, as a rule, are not greatly restricted in those cases where the peronei have not yet become spastic. Forced abduction is the one passive motion which is limited and painful, as this motion further separates the fragments of the scaphoid and calls for resistance on the part of the traumatized and loosened tibialis posticus.

Where a synovitis exists, and the existing trauma has been of a slight character and forgotten, difficulty in explaining the condition is met. Here it is not uncommon to ascribe it to "rheumatism," a blanket term for many diagnostic sins. Upon examination very little, if any, local heat is found, no general rise of temperature is seen—in short, no sign of inflammation is present. Chronic rheumatism is then considered. But why so limited to one joint? Here, again, the thickened scaphoid, the free mid-tarsal joint motion, the slight peroneal contraction, the moderate tenderness over the scaphoid and tibialis posticus, and the unilateral flat foot help us to arrive at our diagnosis. This lack of disability of the tarsal joints, which as a rule hides the true findings of fracture from us, is the true means of diagnosing this traumatic condition from the ordinary rigid flat foot.

CASE II.—R. C., male, white, age fifty-six. His past history is of the best and his habits are good. Family history negative as to the condition under consideration.

The patient, in descending the cellar steps in the dark, a lighted candle in one hand and a coal bucket in the other, slipped on the last step, threw himself backward to regain his equilibrium, felt something give way in each knee, at the same time experiencing acute pain in the same location, and both legs doubled up under him as he fell to the cellar floor. Transverse fracture of each patella was found. He was taken to the Germantown Hospital where he was operated upon five days later by the suture method, as follows:

Through a curved incision, the concavity upward, the fracture of the left patella was uncovered. The upper fragment was larger and represented three-quarters or more of the bone. The fringes of the capsule were inverted, and there were lateral tears for a distance of an inch or a little more on either side. The blood clot, which partially filled the joint, was removed and the surfaces of the broken bone laid bare and the wound in the synovial membrane and capsule closed with two layers of chromic catgut. The incision in the skin was closed with superficial silkworm gut sutures. On the right side, the conditions were practically the same as those on the left with the exception of the fact that the lower fragment was a little larger, possibly one-third of the entire bone. There were, however, the tears of the capsule on either side of the patella. The closure of the wound and the approximation of the bones was affected in the same manner as on the opposite side. Both wounds healed by first intention.

The splints were removed at the end of the first week, and the legs allowed to lie over a pillow in position of semi-flexion. Massage was begun on the tenth day, and passive motion on the seventeenth day, and the patient was allowed to walk at the end of the fourth week. Upon his discharge from the hospital, six weeks after operation, he was able to get around with crutches and could flex both legs almost to a right angle.

At present, about four months since the operation, he goes about the house without crutches, although a crutch is taken as a precaution when going to business. The legs now bend to 90 degrees and he has good extension power.

school-yard, and caught foot in a hollow. Foot was twisted. Got up and walked, but painfully. Was seen by me the next day.

Tenderness and thickening over the scaphoid. No ecchymosis, slight oedema, no crepitus. Manipulations of foot free, except abduction. Some tenderness over posterior tibial. Long arch on this foot somewhat lower than other (right).

*Diagnosis:* Fracture of the scaphoid. Confirmed by radiograph.

CASE III.—S. D., male, age 13. Fell while playing. Next day foot became painful. Saw him on second day after injury. Foot pained him only in walking.

Symptoms were identical to those seen in Case II.

*Diagnosis:* Fracture of scaphoid. X-ray positive.

CASE IV.—R. F., female, age 15. Remembers no definite injury. Foot painful for four weeks, especially on walking. Pain more marked on turning foot and on walking over an uneven surface.

Thickening and oedema over inner side of foot, tenderness and thickening over scaphoid, no ecchymosis, arch lowered, all motions good except abduction.

*Diagnosis:* Fracture of scaphoid. X-ray positive.

CASE V.—E. P., female, age 25, teacher of gymnastics. Turned foot while exercising. Became somewhat swollen and painful. Continued to use foot for three weeks, but with increasing pain. Consulted me three weeks after injury. Slight swelling over ankle-joint, marked tenderness over scaphoid, with thickening over this bone; long arch somewhat depressed, abduction of foot very painful. Other motions of foot good. Ankle motions good.

*Diagnosis:* Fracture of scaphoid. Confirmed by radiograph.

CASE VI.—R. P., female, age 44. In boarding a car which started while patient was on lower step she was thrown forward, striking right foot against upper step. She did not consider herself disabled, and continued her journey, performed her shopping, and returned home four hours later. During this time the discomfort was gradually increasing, and on arriving home I was consulted for a "sprained ankle."

Examination revealed a tender area over the scaphoid, oedema of the tarsus, flattening and thickening of the scaphoid, and tenderness over the posterior tibial. Motions at the astragalo-

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the fractures were transverse. No further mention is made as to the patient's recovery.

H. O. Marcy<sup>16</sup> writes of a woman, thirty-eight years old, who, in a misstep, while crossing from the curbstone to the street, made a violent muscular exertion in trying to save herself from a fall, felt something give way in both knees and she fell to the pavement. Both patellæ were found to be fractured transversely near their middle, the upper fragment lying two inches above the lower. Ligamentous union of about  $\frac{1}{4}$  to  $\frac{1}{2}$  inch followed.

In a letter to Dr. Wight<sup>17</sup> from Dr. Marcy, the latter says concerning the above case: "She could walk fairly well on the level, taking pains to keep the lower limbs nearly straight. Bending the knees gave the fear and indeed, I believe, the sensation of falling. She had great difficulty in going up and down stairs." Dr. Wight also mentions another case reported by Dr. Marcy, of single fracture, with short ligamentous union, who, some years later by muscular action, broke this ligament and also the other patella at the same instant. Dr. Marcy says: "She made a very imperfect recovery, with long ligamentous union. Oddly enough the refractured patella gave the best result in marked contrast to the other patella. She cannot cross from the road to the sidewalk without help, and walks by keeping the lower limbs stiff and swinging them, much as in a case of ankylosed knee." In a letter to the writer, March 18 of this year, concerning the above two cases, Dr. Marcy says: "I sincerely regret that I cannot furnish further details."

Wight, in the same article as quoted above, reports a man, forty-four years of age, with simultaneous transverse fracture of both patellæ from a fall upon the pavement  $3\frac{1}{2}$  years previous to his seeing him. At the time Dr. Wight saw him he was using crutches and wearing splints, allowing partial flexion of the knees. There was fibrous union in both, with one inch separation of the right patellar fragments, and three-quarters of an inch of the left. He could not bend the knees in sitting down nor in going up and down stairs because of the lack of flexion in the knee-joints. He could not walk without the splints.

Wight<sup>18</sup> in a later article reports two cases of simultaneous fracture of both patellæ treated by wiring. One was a man of forty-one years, who received the impact of two hand trucks, one on each knee, and in making strong muscular action at the same time, fractured both knees transversely. He operated one month later, wiring both. Seven months after operation the patient had good functional result.

The second was a forty-year-old man who fell and struck both knees on the pavement. The right patella had been wired six years before for fracture, with good result. Four weeks after the accident he wired the left patella and rewired the right, the wire of the previous operation having broken. Six months later the patient showed full recovery. Wight advises waiting at least fourteen days after injury before operating.

F. H. Hamilton<sup>19</sup>, in a review of 127 cases of fractured patellæ, has only one case of simultaneous fracture of both. This was in a young man twenty-two years of age, who fell on the sidewalk, causing trans-

FIG. 3.



Case II. Marked separation of tubercle of scaphoid.

FIG. 4



Normal.

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week. Plaster-of-Paris casts applied for four weeks longer. Discharged after nine weeks on crutches. Sixteen months after operation there was firm union of the fragments in the right side and flexion to a right angle without pain. Left flexed to slightly beyond a right angle. Function was good in both and there was practically no disability.

Prichard<sup>27</sup> showed a patient in whom both patellæ had been wired for fracture, with very good result.

Colle<sup>28</sup> reports the case of a man who fell from a wall and fractured both patellæ. He was treated by compression, immobilization and massage, with bad result. Fragments were separated two centimetres.

Porter<sup>29</sup> tells of a woman who jumped from a carriage to the ground and sustained fracture of each patella by muscular contraction. Wiring was successfully done.

Peyton<sup>30</sup> saw a case with Bullitt where both knee-caps were transversely fractured while a woman was standing on the icy pavement. Both snapped without any warning, probably due to the action of the quadriceps femoris in an effort to keep her balance. Bullitt operated on the tenth day, suturing the torn fibrous coverings with chromicized catgut. A most satisfactory result followed.

William Maddren<sup>31</sup> reports a woman of twenty-eight years of age who, in going down some steps, fell forward on reaching the last step, as though from weakness of the knees, striking both knees upon the ground. She felt something crack in falling and experienced great pain and loss of function in the knees. Examination revealed swelling of both knee-joints and transverse fracture of each patella. Tight bandages and posterior "L" splints were applied. The fifth day she was taken to the hospital and the fragments drawn in apposition by suturing both Paris casts were applied. Casts removed in six weeks and passive motion begun. Posterior splints were worn a few weeks longer. Result was osseous union of the fragments, with restoration of function.

Mayer<sup>32</sup> tells of a woman of thirty-nine years falling on the left knee, was assisted up, and fell on the right, fracturing both patellæ. She was not operated on for six months and there was no attempt at union. The fragments of the right were separated five centimetres and the left seven centimetres. In operating, the surfaces were freshened, the patellæ looped, and in addition, the fragments were sutured by one wire. A very satisfactory result followed, with flexion of ninety degrees.

McArthur<sup>33</sup> writes of a patient fracturing one patella, treated by splint and massage, with a ligamentous union resulting. Some years later the patient fractured both patellæ simultaneously, but the manner of the fracture is not stated. The lower fragment in the knee which had been broken previously was attached to the lower tendon and was removed; the elongated ligament of union, being attached to the patella, was sutured to the patellar tendon insertion. This gave a good fibrous union and a useful joint. The other patella was wired with silver, resulting in bony union, and the man can walk without even a cane.

Hamilton<sup>34</sup> relates the case of a boy, fifteen years old, falling from a scaffold onto both knees, fracturing the right patella in three pieces and



the left so that a piece turned into the joint, necessitating removal of the piece. Nine days after the accident wiring of the patella was done, and in five months there was good bony union, with good function, allowing him to follow his usual employment.

D. Eve<sup>15</sup> had a woman of thirty-four years, who fell in an elevator, from the third story to the basement, sustaining a fracture of each patella. The right was transverse just below its middle, while the left had one transverse line, as well as an oblique, running into the transverse. Elevation, posterior splints and bandaging comprised the treatment for five days. Then through a longitudinal median incision the torn membranes were sutured close to the bone with iodized catgut, drawing the apposing edges together. The upper part of the patellar tendons were sutured to the lower portion of the quadriceps tendon. Posterior splints were then applied and the legs elevated. After one week plaster casts were applied and allowed to remain for six weeks. Perfect union resulted in both patellæ. Patient soon expected to be on crutches.

Robinson<sup>16</sup> tells of a woman of thirty years, slipping on the stairs, falling forward and was sure she hadn't struck the knees. There was no sign of bruises on the knees, but both patellæ were fractured transversely, the right at the junction of the upper and middle thirds, and the left across its middle. There was fluid and blood in both knees. On the sixth day both were wired, with firm union resulting.

Rutherford Morison<sup>17</sup> reports a young man of thirty-one years, who fell on his face in going rapidly down stairs, with the result of fracturing both knee-caps transversely. There was at least one inch separation. Ten days later he operated, suturing the fragments and aponeurosis with chromic catgut. Gooch splints applied for six weeks. In fifteen weeks the knees would bend to a right angle and he could ride a bicycle perfectly well. Never any pain or stiffness in the knees and he says his legs are as good as ever.

William Sheen<sup>18</sup> writes of a thirty-year-old young man falling down stairs and striking both knees, fracturing each patella transversely. Treated with posterior splints and adhesive plaster for twenty-six days and then plaster casts. When seen by Mr. Sheen he could walk feebly with sticks, so that operation was decided upon, and both knee-caps were wired. About nine weeks later he could walk without crutches and the knees could be bent nearly to a right angle. The final result was good and he had power of going up and down stairs very well.

Lucas-Championnière told Sheen he had three cases of simultaneous fracture of the patellæ. Two were in women and one in a man. In each case one patella was sutured and the other not. As far as he knew all three had, eventually, useful legs. He did not recall the mode of production and they were old cases when he got them.

F. Eve<sup>19</sup> reports the case of a male, forty-one years old, who had broken both patellæ nine months before he saw him. He had been treated by strapping for six weeks, but a subsequent fall left him powerless to walk. There was a separation of three inches on each side. In operating, the insertion of the quadriceps into each upper fragment was

injuries reported by others were of a severe crushing type which resulted in fracture of several bones or comminution of scaphoids.

The treatment in those cases which were seen immediately consisted in immobilization for ten or fourteen days, followed by massage and felt padding under arch. A cork pad was later built in the shoe; in the cases not seen early strapping and felt pads till pain was relieved, then a cork pad in the shoe. A metal plate such as is commonly used is harmful in this class of lowered painful arch. This produces pressure on the painful prominent scaphoid, and keeps up the irritation. The soft felt pad is to be used until all pain is relieved.

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DIRECT SUTURE OF THE BRACHIAL ARTERY  
FOLLOWING RUPTURE, RESULT OF  
TRAUMATISM.

BY J. GARLAND SHERRILL, M.D.,  
OF LOUISVILLE, KY.

IN view of the recent work in the line of vascular surgery, a study of the results of operation of this nature should prove valuable, therefore the following very interesting case is reported.

On December 31, 1912, the following case came under observation: The patient, a young man, twenty-three years of age, in removing some material from a centrifugal machine had his arm caught and twisted in such a way that a backward dislocation resulted at the elbow. When first seen by the writer about an hour later, he was complaining greatly of pain; there was marked swelling in the forearm, which was purple in color, and also an entire absence of radial pulsation, but there were no symptoms of false aneurism present. Both bones of the forearm were dislocated backward at the elbow. It was at once suspected that the brachial artery had been severed; his arm was at first immersed in hot water for some time to determine whether or not the circulation could be restored. At the end of three hours, there being no improvement and a marked increase in the swelling, an incision was made down to the brachial at the bend of the elbow. The humerus, which was lying in front of the condyle of the olecranon, was restored to its position; the ends of the brachial artery stood forth prominently in the wound, both being filled with blood clot, no fresh blood being present. A small amount of clot was found among the torn muscles.

It seemed to the writer that with the blood vessel occluded a noticeable collateral circulation should have formed by this time, if such result were likely to obtain. Therefore, it was

operated, 28 (41.2 per cent.) wired, 19 (28 per cent.) sutured, 3 (4.4 per cent.) looped, and 1 (1.4 per cent.) removed. In all, 51 patellæ were treated by an open operative method and each obtained a good functional result. Of the non-operative cases, several resulted rather badly. Case No. 35 in the tabulated summary, originally treated by non-operative methods with a bad result, later had the patellæ wired, thus regaining the function of the limbs.

Wight<sup>16</sup> back in 1884 wrote, "In fact, a patient having had both patellæ fractured at the same time may reasonably expect to become a most deplorable and pitiable cripple." In a letter received from him a few days ago, he shows a marked change in his attitude concerning the above by saying, "The statement you refer to no longer holds good. The modern method of suturing gives a restoration of function, providing the rent in the capsule on either side of the patella is carefully closed to its extreme limits." It is more than evident from the above, that the added risk in the operative treatment in the hands of a skilled operator is far and away outclassed by the good functional result obtained. Operation should not, however, be advised where there is a slight separation of the fragments, in incomplete fractures, nor is the subaponeurotic and longitudinal types, for these almost invariably give good union of the fragments. If there is a contra-indication to general anaesthesia from advanced consumption, diabetes, hepatic or cardiorenal disease, the operation may be done under local or low spinal anaesthesia.

The time of operation varies greatly with different men, ranging from a day to three weeks, the variance being due to the question whether or not it is better to operate before, during or after swelling in the knee-joint.

As to the operation of choice, there is not a great difference so far as the functional outcome is concerned. In the cases herein reported the wiring, suturing and looping methods seem to give equally good functional results. The wiring method, according to Dennis,<sup>43</sup> first done by John Rhea Barton, of Philadelphia, in 1834, and later revived by Mr. Lister, has many advocates.



SIMULTANEOUS FRACTURE OF BOTH PATELLÆ. 525

- <sup>7</sup> Cooper, Sir Astley: *A Treatise on Dislocations and on Fractures of the Joints*, 1823, pp. 210, 212.
- <sup>8</sup> Lancet, Lond., 1827-1828, ii, 159.
- <sup>9</sup> Tufnell, J.: *Dublin Medical Press*, 1861, xlvi, pt. 2, 405, 1870, p. 48.
- <sup>10</sup> Johnston, R.: *Lancet, Lond.*, 1873, ii, 661.
- <sup>11</sup> Boston Med. and Surg. Journal, 1876, xcvi, 666. Also Hamilton on Fractures, p. 433.
- <sup>12</sup> Cooper: *Treatise on Dislocations and on Fractures of the Joints*, 1823, p. 207.
- <sup>13</sup> Godfrey, Thomas: *Brit. Med. Jour., Lond.*, 1873, ii, 594.
- <sup>14</sup> Wendover: *Med. Record, N. Y.*, 1875, x, 645.
- <sup>15</sup> Marcy, H. O.: *Boston Med. and Surg. Jour.*, 1874, xci (N. S., xiv), 362.
- <sup>16</sup> Wight, J. S.: *New York Med. Jour.*, 1884, xxxiv, 541-542.
- <sup>17</sup> Wight, J. S.: *Phila. Med. Jour.*, 1900, v, 64-66.
- <sup>18</sup> Hamilton, F. H.: *Monograph on "Fracture of the Patella, a Study of 127 Cases,"* also in *Hosp. Gaz., N. Y.*, 1879, vi, pp. 419, 438, 535, 565.
- <sup>19</sup> Beauvias: *Med. Times and Gaz.*, 1880, ii, 424.
- <sup>20</sup> Desquin, Victor: *Ann. Soc. Méd. d'Avers*, 1881, xlvi, 269-276.
- <sup>21</sup> Moullin, Mansell: *Surgery*, 1891, 474.
- <sup>22</sup> Smith, T. A.: *Tr. Soc. Alumni Bellevue Hosp., N. Y.*, 1896-1897, 184. Also *N. Y. Med. Jour.*, 1897, lxvi, No. 2, 468.
- <sup>23</sup> Chaput: *La Semaine Méd.*, Paris, 1897, xvii, 199.
- <sup>24</sup> Lafourcade: *Gaz. Méd. de Paris*, 1897, ro. s., i, 247. Also *Rev. de Chir.*, Paris, 1897, xvii, 530.
- <sup>25</sup> Warbasse, J. P.: *ANN. SURG., Phila.*, 1898, xxvii, 601-606.
- <sup>26</sup> Scudder, Chas. L.: *Bost. Med. and Surg. Jour.*, 1898, cxxxviii, 231.
- <sup>27</sup> Pritchard, A. W.: *Brit. Med. Jour.*, 1899, i, 876.
- <sup>28</sup> Colle: *Bull. Soc. Centr. de méd. du nord*, Lille, 1902, 219.
- <sup>29</sup> Porter, C. B.: *Bost. Med. and Surg. Jour.*, 1902, cxlvii, 416.
- <sup>30</sup> Peyton, D. C.: *Amer. Med.*, 1903, v, 211.
- <sup>31</sup> Maddren, Wm.: *Brooklyn Med. Jour.*, 1904, xviii, 193.
- <sup>32</sup> Mayer: *Verhand. der Deutsch Gesellsch. f. Chir.*, 1905, xxxiv, 191.
- <sup>33</sup> McArthur, L. L.: *Surg., Gynec. and Obst.*, Chicago, 1906, iii, 823.
- <sup>34</sup> Hamilton, G. G.: *Edinb. Med. Jour.*, 1906, lxi, 206.
- <sup>35</sup> Eve, D.: *South. Pract., Nashville*, 1907, xxix, 573-577.
- <sup>36</sup> Robinson, H. B.: *Lancet, Lond.*, 1909, ii, 1498.
- <sup>37</sup> Morison, Rutherford: *Surg., Gynec. and Obst., Chicago*, 1909, ix, 288-292.
- <sup>38</sup> Sheen, William: *Lancet, Lond.*, 1909, ii, 1425-1426.
- <sup>39</sup> Eve, Frederic: *Proc. Roy. Soc. Med., Lond.*, 1909-1910, iii, i, Clin. Sect., p. 78.
- <sup>40</sup> Barcus, Paul J.: *Jour. Indiana Med. Assoc., Ft. Wayne*, 1910, iii, 484-487.
- <sup>41</sup> Nassau, C. F.: *ANN. SURG., Phila.*, 1912, iv, i, 638.
- <sup>42</sup> Malgaigne, J. F.: *A Treatise on Fractures. Translated by J. H. Packard*, p. 602.
- <sup>43</sup> Dennis: *Med. News, Phila.*, 1885, xlvii, 495-497. Also *Bost. Med. and Surg. Jour.*, 1885, cxiii, 421-423.
- <sup>44</sup> Andrews: *Surg., Gynec. and Obst., Chicago*, 1906, iii, 822.
- <sup>45</sup> Andrews: *Railway Surg. Jour., Chicago*, 1910-1911, xvii, 11-17.

the vessel was completed the circulation had returned in the hand, although we were unable to certainly determine a pulse at the radial artery. The patient made a somewhat protracted convalescence and has been disturbed some by the numbness in the fingers, which probably resulted from the stretching of the median nerve. There has also been some slight impairment of motion at the elbow. This is gradually disappearing and it is hoped that he will have complete restoration of function. At the present time the radial pulse is quite as good as in the other arm, and it is possible that the reason it was not felt immediately after the operation was in part due to the swelling and in part due to the fact that there was a slight narrowing of the lumen of the artery at the point of suture, which only permitted a portion of the blood stream to pass. Prompt restoration of circulation in the hand following the suturing and our inability to obtain the restoration of function prior to the operation leads to the conclusion that this boy would have lost his arm had not the direct suture been done. Granting, however, that the collateral circulation might have been restored without anastomosing the vessel, it certainly occurred very much more promptly following the operation than would have been at all likely otherwise.

The writer wishes to express his thanks to Drs. Carrel and Crile for their work along this line and the description of the operative technic which enabled him to perform this operation without any difficulty.

It would seem that this case was of sufficient interest to be recorded and that these gentlemen have opened a field in surgery which will allow the accomplishment of many operations which would not have been considered formerly.

Uncomplicated fractures of this bone are not as rare as are commonly supposed. They frequently pass as sprains of a severe type. There is usually no total disability following a fracture of the scaphoid, and for this reason a fracture is not suspected. The bone is normally prominent, and the increased prominence is taken as a bruise or synovitis. Crepitus is not one of its common symptoms, motion of the mid-tarsal joints is not greatly limited, and the tenderness is not intense. The greatest discomfort is felt in walking, as in that act the scaphoid, being the highest point of the long arch of the foot, does not give the proper support to the body. A traumatic flat foot, with its train of symptoms, results.

No great violence is required to produce this fracture. A misstep, a turn of the foot, or a moderate blow is sufficient. The break is always found at the tubercle. The tubercle of the scaphoid has a separate centre of ossification and can practically be considered as an epiphysis. This will explain why this injury is more often noted in adolescence, when the epiphyseal line is very active and vascular. Other epiphyseal fractures at this period are comparatively common, and this can be classed among them. Placed as the scaphoid is, at the highest point of the arch, with no support beneath it, it would naturally take less violence to injure it than any other of the tarsal bones. Again, the powerful tibialis posticus is attached to the tubercle, and any undue tension on this muscle would tear this portion of the bone from the scaphoid. These factors will readily explain why the tubercle is the seat of fracture.

*Symptoms.*—When seen in an adolescent, the symptoms vary to a degree from those seen in the adult. Frequently the original injury has been forgotten, and is not considered to have played a part in the production of the resulting painful weak foot. It is for a "weak ankle" that relief is sought. Upon examination a weak or a flat foot is the condition at first glance noted. It differs, however, from an ordinary weak foot. The abduction is more pronounced and of a painful character. The scaphoid is displaced downward, is thickened and tender. In a flat foot of whatever degree tenderness of



This report is based upon eight cases—four in the adolescent and four in the adult. In none of these cases were the other tarsal bones involved. In the few cases thus far described this injury was always accompanied by one or more of the other tarsal bones, and the trauma always of a severe type. The conclusion had naturally been drawn that fracture of the scaphoid as an entity was rare. This can now readily be disproved.

## CASE REPORTS.

**CASE I.**—C. F., female, age 14. Remembers no direct injury. Thinks that one month before any pain appeared in the foot she tripped and fell going up-stairs. Was not disabled. About four weeks later left foot became painful and patient began to limp. Disability increased, and two weeks later she consulted me. The entire ankle, inner and outer side, was oedematous. (This was also noted on the other foot.) Motions at astragalo-tibial joint good, mid-tarsal restricted, in abduction. Adduction good. Tenderness over scaphoid. Walks with decided limp. Both feet flabby, of the underdeveloped adolescent female type. Has been wearing metal plates, and the irritation at the scaphoid was at first assigned to pressure from it. Pain was experienced only in walking. A suggestion of ecchymosis present. Provisional diagnosis: Fracture of scaphoid, corroborated by X-ray. The probable cause of this fracture, the muscular action of the posterior tibial upon the tubercle of the scaphoid.

The metal plate worn by the patient really exaggerated the pain in the scaphoid by direct pressure. The added fact that this pain was noted only during the act of walking corroborates it. From this case and from the following ones we will note that the usual method of treating weak feet by the use of metal plates is in this class of traumatic weak feet very injurious. A yielding, semi-elastic material, such as cork, is the best object to use.

In this case the treatment consisted of padding the foot with felt and bandaging until the tenderness disappeared (about three weeks), and then applying a shoe with a cork pad built in the arch. Massage and exercise.

**CASE II.**—S. H., male, age 15. Stumbled while at play in the

fluids which are not too dense and viscid pass through the lumina of the outer tube to the tip of the inner tube where they are aspirated, the intestine or omentum is not sucked into the fenestrations. In its daily use at the New York Hospital for about six years no recognizable injury has resulted.

Many varieties of tips have been made and tried. The one that has finally proved most satisfactory for routine work is a *straight tip without irrigating tube* (Fig. 1). The irrigating tube has been eliminated as unnecessary. In this respect we have reverted to our original type. In the rare event of irrigation being indicated, a separate irrigating nozzle may be inserted by the side of the suction tip.

A few words in regard to our experience as to structural details may be appropriate. As originally made, the tips presented three objectionable features. The tip of the outer tube

FIG. 1.



Straight tip without irrigating tube for aspiration in abdominal operations.

was composed of a separate piece of metal cemented to the main tube. It frequently separated when the instrument was dropped. The curved outer end of the inner tube occasionally became acutely bent or broken as a result of rough usage. Finally, the end for connection with the rubber tubing was difficult to adjust. In the present model these disadvantages are avoided. The tip of the outer tube is made of the same piece of metal as the rest of the tube. The inner tube is comparatively heavy and straight with a coarse screw-thread olivary end for connection with the rubber tubing. The straight tube has proved much stronger than the bent, and the olivary end ensures a satisfactory and easy connection with the rubber tube. The tip here described is of convenient size and its strong construction enables it to withstand constant rough usage.

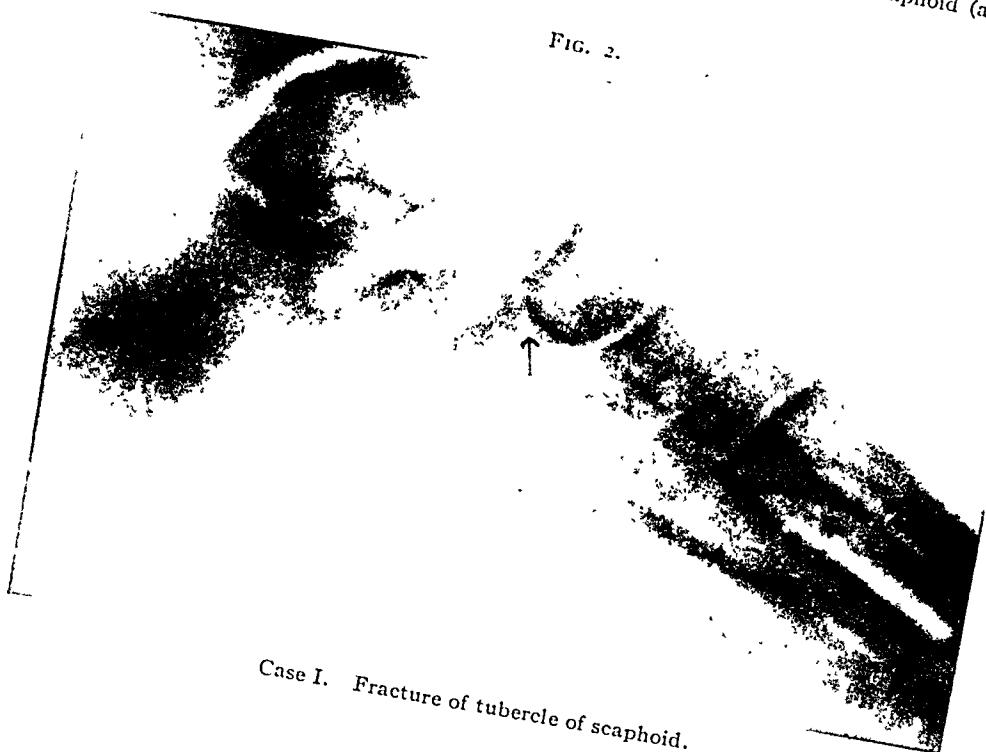
While suction may be produced by various methods, we

FIG. 1.



Case I. Traumatic flat-foot (left) resulting from fracture of tubercle of scaphoid (adolescent).

FIG. 2.



Case I. Fracture of tubercle of scaphoid.

TRANSACTIONS  
OF THE  
PHILADELPHIA ACADEMY OF SURGERY.

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*Stated Meeting, held April 7, 1913.*

DR. GWILYM G. DAVIS, President, in the Chair.

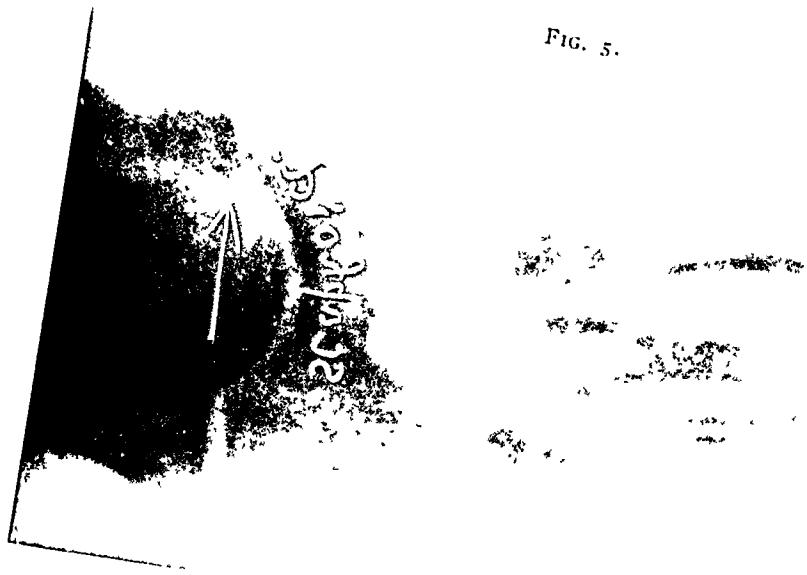
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SPOROTRICHOSIS.

DR. MORRIS BOOTH MILLER presented a man of 51, who, while engaged in his work, that of handling tin scrap (including old cans) prior to its reduction, received a small scratch from a piece of dirty tin on the flexor surface of his right forearm. This occurred over a year ago and since that time he has had one or more running sores in and about the elbow. While one area would heal another would break down. In consequence numerous scars can be seen surrounding the two or three sinuses which are now present. The area affected is the upper third of the forearm, about the elbow, and slightly above it, but at no time has there been any tendency to spread far from the original point of injury. There has been no involvement of the joint or indeed to a greater depth than the subcutaneous tissue. The use of the arm is unimpaired in range and strength. The inflammation has been of a low grade and the discharge has always been thin and brownish and rather profuse. The sinuses show somewhat pale granulomata in abundance. Some of these were excised and the presence of the *Sporothrix schenckii* was demonstrated in both of its forms, in the slender branching mycelia from smears and in the ovoid spores, about the size of a red blood corpuscle, in the granulation tissue.

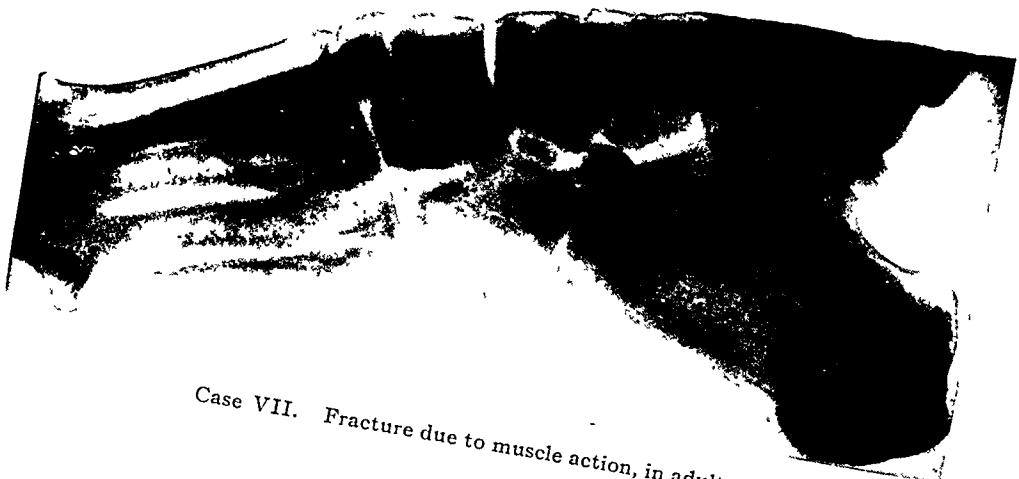
Since this organism was first identified by Schenck, in 1898 (*Johns Hopkins Hosp. Bull.*, 1898, p. 286), it has been recognized as the cause of low grade inflammations of a chronic type affecting man. It also attacks some of the lower animals such as the dog and the horse. It has been carefully studied by the

FIG. 5.



Case VI. Separation of tubercle, in adult.

FIG. 6.



Case VII. Fracture due to muscle action, in adult.

a retained tooth under the orbit. The maxilla was short one canine tooth which had not erupted. The cyst was removed intact and the tooth was shown to be well developed. The cyst contained straw colored fluid and the walls contained embryonic dental tissue. Dr. DaCosta exhibited the patient in order to show how little deformity had resulted from the operation.

DR. MORRIS BOOTH MILLER reported some further facts regarding my case of symmetrical odontoma, simulating one of the cases reported. After exhibiting this patient to the Academy at the March meeting he operated and found that the overgrowth was solid and apparently made up of cancellated bone tissue, not cystic as he had supposed. It was probably an adamantine odontoma as only the alveolar portion of the jaw was involved. The perfect symmetry and the simultaneous involvement of both jaws characterizes this case as an exceedingly rare form.

#### OPERATIVE REDUCTION OF OLD DISLOCATION OF THE SHOULDER.

DR. JOHN H. JOPSON reported the case of a woman, aged fifty-eight years, who was admitted to the Polyclinic Hospital November 25, 1912, and discharged January 31, 1913.

She gave a history of a fall and injury of her right shoulder about two and a half months previously. The arm was treated by bandages and fixation for three weeks after which she removed them. Limitation of motion had continued since that time. Examination of the shoulder showed an unreduced sub-coracoid dislocation to be present. The usual symptoms of an old luxation were observed, except that pain was not much complained of.

On November 27 reduction under ether was attempted. Prolonged attempts at reduction by the Kocher, and other methods, failed to replace the head of the humerus in the glenoid cavity, although its position seemed somewhat improved. Subsequent examinations showed that the head of the bone was still beneath the coracoid and this was confirmed by radiographs which also demonstrated an old healed fracture of the tuberosities (Fig. 1).

Open operation was recommended and consented to, but owing to the development of an obstinate bronchitis, it was delayed

## FRACTURES OF TARSAL SCAPHOID.

tibial joint good. At the mid-tarsal joint abduction was painful and limited, adduction good. Slight ecchymosis over scaphoid, no crepitus.

*Diagnosis:* Fracture of scaphoid. Confirmed by radiograph.

CASE VII.—E. C., female, age 37. Turned foot while walking. Disability immediate, and had to be assisted home. Saw patient two hours later. Foot somewhat swollen, no ecchymosis. Tenderness over scaphoid and up toward leg (over posterior tibial). Flattening and thickening over scaphoid. Abduction of foot painful, other motions free.

*Diagnosis:* Fracture of scaphoid. Confirmed by radiograph.

CASE VIII.—Mrs. F. B., age 48. About six months ago sprained ankle. Felt uncomfortable for several weeks, but was not laid up. Discomfort has gradually increased, finally ending in what the patient claimed to be total disability. Upon examination the scaphoid was very tender, the arch low, abduction of the foot limited and extremely painful. Other motions of the foot were free.

Patient is of an extremely nervous type, and much of her pain may safely be discounted. The radiograph, however, showed a fracture of the tubercle of the scaphoid, with a wide separation from the rest of the scaphoid.

This patient is still under treatment and prognosis is indefinite.

### RECAPITULATION.

In all of these cases the symptoms were constant, representing an entity. The injury was slight, the disability (with one exception) not immediate. Crepitus absent, ecchymosis slight; scaphoid thickened, flattened, and tender; tenderness along posterior tibial muscle; motions at astragalo-tibial joint not impaired; abduction of foot practically the only motion limited; long arch of foot depressed.

The radiograph in all cases revealed a fracture of the tubercle. No other bones were involved. In all cases a traumatic flat foot resulted.

In the four adolescent cases muscle tension was the only injury. In the adult cases two were of this same class, the other two received injuries of a more severe type. The

FIG. 2



Subcoracoid dislocation   Healed fracture of greater tuberosity

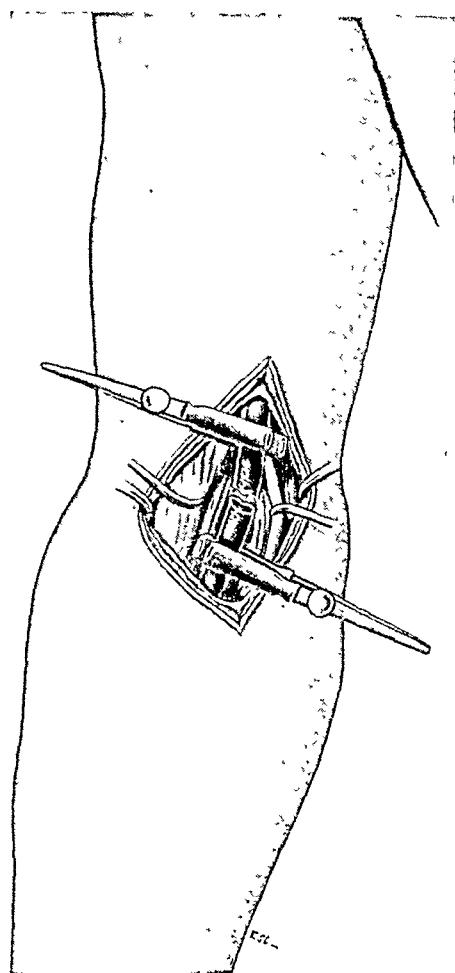
CYST OF THE FIFTH METACARPAL BONE,  
A COMPLICATION OF CHRONIC OSTEO-ARTHRITIS.  
BY JOHN R. McDILL, M.D.,  
OF MILWAUKEE, WIS.

This case is reported for purposes of record. Since the subject of bone cysts has received so much attention cases are coming to light rapidly, but so far none have been reported in the long bones of the hands or feet. This case is from a woman sixty-five years of age, who has suffered from chronic "indigestion" for forty years; chronic recurrent tonsillitis about as long, and for the last 25 years has had a constantly increasing cardiovascular disease which at present shows a heart enormously dilated and hypertrophied, tumultuous arrhythmia, the cardiac muscles weak and relaxed, and showing considerable degeneration. The osteo-arthropathic changes are not extreme, and are plainly seen in the skiagraph; the attacks that led to them are periodical and are concomitant with appendiceal and gastric symptoms. Wassermann reaction negative. Noguchi's luetin reaction negative. Three years ago a small painless swelling with no discoloration began over the fifth metacarpal bone, and gradually increased for one year when it rapidly swelled, became painful, and was opened, giving exit to stringy mucopus, which as rapidly subsided, and seemed about to heal when six weeks later it opened again near the old incision, evacuating more stringy pus; it was poulticed for one year, during which time it opened every three or six days to discharge a drop or fraction of a drop of a clear fluid; during the last year it discharged about every six weeks; there is no enlargement of the bone.

favorite. Muscles which prevent reduction must be divided and can be subsequently sutured. Portions of the joint capsule often require excision. The mortality is very low, almost nil, and while the final result, as Jonas says, leaves much to be desired, there is oftentimes very fair restoration of function along with relief of pain and circulatory disturbances due to pressure.

DR. T. TURNER THOMAS said that after study and analysis of the cases he had seen and those he had read of, and of the cadaver dislocation, he had found that the structure which held and which must be overcome to get reduction in these cases was just such a portion of the capsule as Dr. Jopson had mentioned. It ought to be borne in mind, however, that in this case the real trouble still exists, the limitation of movement, and just what the patient will get ultimately is the important thing. In his own work, his trouble was not so much in the reduction as in getting good use of the arm afterward, and he had given up in some cases all hope of normal function. In one case he reported there was a dislocation on each side, one of four years and four months' standing and one of only four months' standing; he reduced the latter without operation but failed to reduce the former; however, the reduced dislocation was later the worse of the two, as it allowed of less movement and gave more pain. As time goes on there are changes in the joint making normal function difficult. Another thing was the fact that Dr. Jopson did not find the long head of the biceps. He had tried to show that the mechanism of the tearing away of the glenoid attachment of the long head of the biceps was the mechanism of the fracture of the greater tuberosity. In his patient with double dislocation, he operated on the reduced side more than a year after the reduction to see if he could improve the conditions, and found the long head of the biceps had been torn away and that the detached end was considerably below its normal level and adherent in its bony groove. It had very much atrophied. He suspected that the tendon in Dr. Jopson's case had torn away and was not cut but was adherent in bicipital groove. So far as he could see the results in this case do not prove that operative treatment was the best for all cases or even for cases after four, five or six weeks, as has been advised by Dollinger, who says that if we divide the subscapularis we can get them back easily.

FIG. I.



Exposure of wounded artery preliminary to suture.



lymphangiosarcoma in the lower lip of a child aged ten, suspected by the surgeon of being sarcoma.

In 1909 (*Proceed. Societe Anatomique de Paris*, February 5), Hardouin reported the case of a young woman twenty-two years old, with a large globocelled sarcoma on the left upper lip. The pre-operative diagnosis was angioma. The lip was greatly enlarged and deformed and the growth had infiltrated the muscles of the region.

The difficulty of diagnosis between sarcoma and epithelioma, both clinically and microscopically, is demonstrated by the following case mentioned by Coley (*New York Med. Jour.*, 1891, liii, p. 706), the growth being on the right lower lip of a male of forty-five. The appearance and clinical history pointed to epithelioma; careful microscopical examination by the pathologist reported it as sarcoma. Two months later recurrence in the submaxillary and deep cervical nodes. Excision. The microscope showed the disease to be unquestionably epithelioma which at first had been so disguised by inflammatory reaction that it was mistaken for sarcoma.

The following five cases, together with the one just cited, although occurring in literature on this subject, seem to us either not to have been primarily sarcoma, or to have been sarcoma originating in neighboring structures with secondary involvement of the lip.

A case reported by M. Geraud (*Proceed. Societe Anatomique de Paris*, March 4, 1902). A small tumor removed from the lower lip of a young woman which had developed in about three weeks, had reached the size of a pea, and presented the characteristics of a telangiectatic sarcoma.

A case mentioned by M. Schwartz (*Societe de Chirurgie de Paris*, May 20, 1903), having a fusocelled sarcoma of the cheek involving the lip, in a man sixty-six years of age. The tumor weighed two kilogrammes.

Langston (*Indian Med. Gaz.*, Calcutta, July, 1909) writes of a case resembling macrocheilia, involving the whole lower lip, with an ulcerated, bleeding surface, having many resemblances to lymphangioma-cavernosum. The patient, however, gave a history of always having had a very large lip growing more in the last three years but with no glandular involvement and no secondary deposits anywhere. Microscopically the report was a large celled sarcoma. This was probably a macrocheilia with a nucleus of embryonic tissue, taking on active growth in middle life, or else an angiosarcoma congenital, in which the sarcomatous element had remained dormant for a long period of time and then became active.

Steeves (*Trans. Path. Soc.*, London, xxxvii, pp. 85-86) also mentions the case of a small melanotic growth on the upper lip of a female aged thirty-seven. There had been no previous mole or pigment spot. It was removed with recurrence locally and in the cheek and submaxillary nodes,

concluded that a direct suture of the torn ends of the artery offered to the patient the best possible chance of saving his arm. The clots were removed from both the distal and proximal ends of the vessel and a Crile clamp then placed upon each to control bleeding during the steps of the operation. It is likely that the clamp on the lower end was not necessary, as that vessel did not bleed when the clot was removed, but its use facilitated considerably the manipulation of the torn vessel. The sheath of the artery was torn away from the distal portion and had contracted somewhat over the proximal end. This was held out of the way while the vessel itself was sutured. In making the anastomosis, the method described by Carrel and employed by Crile was used. A very fine linen thread was separated into its three primary strands, one of which was carried through a very fine round needle (No. 16, Kirby), the thread being previously saturated with sterile vaseline. Three guy sutures were passed through the coats of the vessel; the lower suture was held by a forceps which was allowed to hang down, and the other two caught by forceps which were held by my assistant, thus giving a straight line for the suturing, which was done by continuous suture. The dragging of the forceps below prevented any possibility of catching the wall opposite the line of intended suture. The vessel was turned after each suture in such a way that each side of the triangle was completely closed. After this was accomplished the clamps were released and the blood was allowed to flow, a small amount escaping; an additional suture controlled the hemorrhage and the sheath was drawn down from the proximal side and united to that from which it had been torn below. Following this the clamps were again removed and the blood allowed to flow through the line of anastomosis which it did without any escaping from the vessel.

The median nerve was exposed in the wound but was apparently uninjured. The wound was closed without drainage and the arm put up in a voluminous dressing in a position of partial flexion. Within five minutes after the suturing of

submaxillary nodes on both sides were enlarged, hard and partially fixed, the left more than those on the right side. The anterior cervical nodes were also palpable but freely movable. His blood showed a moderate anaemia with 11,200 leucocytes.

On October 7, under intratracheal anaesthesia, through oblique incisions, the submaxillary glands, lymph nodes and lymph bearing tissue were removed and after closure of the wounds, the primary growth was excised, together with a square block of tissue representing a considerable portion of the lip and chin.

The pathological examination of the specimen showed a normal squamous epithelial covering except where the ulceration was present. Beneath this and extending for one centimetre into the subcutaneous and muscular tissue, was an area composed chiefly of spindle cells, arranged in more or less definite bands. The cells were extremely irregular in size and staining qualities. The tissue, entirely cellular in character, presented all the characteristics of a mixed celled sarcoma, apparently of a rather malignant type. At its lower edge the tumor could be seen distinctly infiltrating the muscular tissue.

The lymph nodes showed microscopically almost complete transformation into tissue similar to that just described. Only here and there were portions of normal lymphoid tissue to be seen.

The plan of operation in this case was modified somewhat from that which Dr. Frazier usually employs. Ordinarily a complete block dissection of the anterior triangle of the neck is made, prior to removal of the primary lesion. When the growth is a unilateral one, this dissection is confined to one side of the neck. In the case under consideration, on account of the advanced age of the patient, the dissection was confined to the submaxillary region and did not include the entire anterior triangle.

The patient reacted promptly from the effects of the operation and was discharged from the hospital on the eleventh day. One month later he noticed the appearance of enlarged nodes on both sides along the borders of the sternocleidomastoid muscles, and two months after a second operation was performed at which the infiltrated muscle together with a mass of enlarged glands was removed on the right side. Although only



of the disease during operative manipulations and there is much to be said in its favor. The rapid dissemination of a lesion as malignant as sarcoma is surely to be expected if any malignant cells have been left behind, in a field where so many lymphatic channels have been opened and I am inclined to believe that the use of Harrington's solution may be effective in sealing the lymphatic channels, destroying cells and leaving a less fertile field for cellular proliferation.

#### SIMULTANEOUS FRACTURE OF BOTH PATELLÆ.

DR. CARL R. STEINKE read a paper entitled "Simultaneous Fracture of Both Patellæ; Report of Two Cases and Review of Literature," for which see page 510.

#### FRACTURE THROUGH THE TROCHANTERS OF THE FEMUR.

DR. ASTLEY P. C. ASHHURST read a paper on "Fracture Through the Trochanters of the Femur," for which see page 494.

#### TREATMENT OF TUBERCULOUS CERVICAL LYMPHADENITIS.

DR. GEORGE P. MÜLLER read a paper with the above title, for which see page 433.

DR. ASTLEY P. C. ASHHURST said that the main thing in tuberculous cervical adenitis was to recognize that it is not a disease in itself but is secondary to an infection some place else, and one may do all the operations one wants, but if the patients have pediculi or decayed teeth, or infections of the nasopharynx, etc., which are left untreated, recurrence of the cervical adenitis is almost certain. Unless one finds out the source of the infection and cures that, there is little use in removing the secondary lesion in the neck. Whether at an operation one can remove all the lymph nodes he did not know. In the dissecting room he had found them to go down beneath the scalene muscles and across the mid-line behind the trachea, so that it seemed to him impossible to believe that one can take them all out during life in every case. Theoretically, however, the lymph nodes do not extend beneath the deep fascia. The operation always is difficult and should not be undertaken by those who are not good anatomists and who do not know how to dissect.

Hemorrhage may be dangerous and one must be prepared for it. Once he had to ligate the internal jugular vein and the

SUCTION TIP FOR ASPIRATION IN ABDOMINAL  
OPERATIONS.

BY EUGENE H. POOL, M.D.,

OF NEW YORK,

Hospital.

Attending Surgeon to French Hospital; Associate Attending Surgeon to the New York

AN apparatus for aspiration, described by J. H. Kenyon and E. H. Pool, in *Surgery, Gynaecology and Obstetrics*, December, 1909, is in daily use in the operating rooms of the New York Hospital. The details of the apparatus and its manifold uses were given in that article.

We have found the procedure especially serviceable in operations within the peritoneal cavity for the rapid removal of large accumulations of pus, blood, and other fluids; also, as a substitute for or adjunct to gauze sponging in the removal of small amounts of pus and blood, since its use entails much less trauma to the peritoneum than is produced by sponging with gauze. These applications of aspiration have been adopted by others with some hesitation, because it is not generally understood how any tube connected with powerful suction can be passed into the abdominal cavity without drawing into its lumen intestine or omentum, thus becoming plugged and causing injury to these structures. Such incredulity has led to this report.

The important feature of the apparatus in abdominal cases is the tip, which consists of an inner, suction tube, and an outer, protecting tube. The inner tube has two openings at its tip. The outer tube has numerous perforations in its distal third and several openings at its proximal or outer end so arranged that the hand of the operator cannot occlude them. These openings at the outer end allow a column of air to pass freely from outside of the wound between the outer and inner tubes to the end of the inner tube. In consequence, a vacuum cannot be formed under any conditions. Therefore, while

tuberculin treatment. They have had no bad effects from the tuberculin, as they begin with a small dose and increase it gradually every five to seven days, watching closely for any marked reaction.

DR. GEORGE P. MÜLLER (in closing) called attention, in regard to tuberculin, to the fact that in many of these cases the element of time is an important one. Operation removes the focus of infection entirely or partially at one stroke and if the operation is performed early and properly, practically every wound should heal within ten days. The patient can then be treated with much greater advantage by the various other methods. Tuberculin treatment without operation is long drawn out, requiring many months or years and at least a weekly visit to the physician or dispensary. An examination of the existing statistics shows results of only about 60 per cent. recovery and improvement, whereas the statistics as shown in my paper give better results from operation. Furthermore, it is probable that many of these patients would have recovered under purely hygienic regulations. There is nothing magical or marvellous about tuberculin. It merely stimulates resistance. Many cases do not do well under tuberculin and sometimes serious results have occurred.

OPERATIONS IN THE CLINIC OF THE PROTESTANT  
EPISCOPAL HOSPITAL OF PHILADELPHIA.

DR. CHARLES H. FRAZIER read this paper.

use an "ejector" attached to the steam pipe in the engine room, whence a metal pipe leads to the operating room. A non-collapsible rubber hose (known to the trade as "pressure" tubing or "four-ply insertion" tubing) leads from the suction pipe to a gallon bottle under the operating table. It is essential that non-collapsible tubing be used. From this bottle a comparatively short hose of the above material leads to the operating field. When instruments are prepared for operations, the suction tip and the rubber tube leading from the bottle to the field of operation are boiled as routine and are always ready for instant use.

was still very pronounced. The general appearance of the patient had somewhat improved.

Upon examination, the white fluid removed from the abdomen was found to be neutral in reaction; it had a specific gravity of 1008, and contained a heavy precipitate of albumen, a distinct trace of sugar, with fat globules and fatty acid crystals. It was doubtless chyle. The coffee-colored fluid found in the retro-peritoneal cyst was neutral, with a specific gravity of 1012, and contained a slight trace of albumen; no sugar. Microscopically it was negative, and there were no evidences of pancreatic ferments.

DR. ARPAD G. GERSTER said that from the history of the case shown by Dr. Collins one would be justified to assume that a direct rupture of the thoracic duct had occurred, and such a lesion would be very probable if it could be shown that the distention of the abdomen came on shortly after the injury.

DR. F. KAMMERER said he agreed with Dr. Gerster that the history of Dr. Collins' case pointed rather to a lesion of the thoracic duct, and not to simple compression of the duct by a comparatively small cystic tumor.

DR. COLLINS, in reply to a question, said that so far as he could learn from the boy's parents, the abdominal distention came on gradually—not suddenly, as one would expect in a case of rupture of the thoracic duct.

ACUTE PHLEGMON OF THE ASCENDING COLON: BEGINNING INTUSSUSCEPTION OF THE CAPUT COLI, ASSOCIATED WITH THE PRESENCE OF THREAD WORMS. RESECTION.

DR. COLLINS presented a negro boy, eleven years old, who came from Trinidad two months ago, and was admitted to the J. Hood Wright Hospital on March 10, 1913, with the history that for two days he had suffered from abdominal pain, paroxysmal in character, and of increasing severity.

Examination showed marked right-sided rigidity of the abdomen, and under ether, a sausage shaped mass, three inches long, could be made out on that side. Upon opening the abdomen in the midline, the ascending colon was found to be greatly thickened, with oedema of its walls, so that the lumen of that section of the gut was almost occluded. There was beginning intussusception of the floor of the caput coli. The lymph nodes of the

French observers, De Beurmann and Gougerot, who have recently published a brochure on the subject. It has been observed on decaying vegetable matter and this was probably the source of the infection in the present case. The invasion is through the skin, and it travels along the lymphatics with the development of subcutaneous nodules. The discharge is usually brownish in color and gelatinous in consistency. According to Widal and Weil the spores agglutinate when mixed with serum in dilutions of from 1-200 to 1-500.

The treatment is simple and efficacious, consisting of the local application of dilute solutions of iodine and the internal administration of full doses of iodide of potassium.

#### SPLENECTOMY FOR BANTI'S DISEASE.

DR. J. CHALMERS DACOSTA showed a spleen he had recently removed from a patient who was the victim of Banti's disease. He stated his belief that a very large spleen, if free from adhesions, can be more easily removed than a much smaller spleen, because, when the spleen is much enlarged the pedicle is thrown toward the front and into a region where it is readily accessible. The patient recovered. About 10 days after the operation he developed grievous pains in the ribs, sternum, vertebrae and the bones of the extremities, due doubtless to over stimulation of the marrow. These pains lasted for a number of days. There was a decided leucocytosis.

#### SUBFASCIAL TUBERCLE.

DR. DACOSTA exhibited a painful tubercle removed from between the fibres of the left great pectoral muscle. It had all the characteristics, clinical and microscopical, of a painful subcutaneous tubercle and yet it was subfascial. The description given by Paget of the symptoms of a subcutaneous tubercle were exactly imitated in this case. Paget's description written more than 50 years ago is still copied by most modern writers.

#### DENTIGEROUS CYST.

DR. DACOSTA also showed a dentigerous cyst (follicular odontome), removed from the right upper jaw of a negro, eighteen years of age. The X-ray picture, taken before operation, showed

and he simply showed these, together with the radiographic findings, in order to emphasize the frequency of a condition which was so often overlooked.

These patients sometimes had more or less throat or pulmonary irritation, due to the presence of the supernumerary rib, and in one of his cases the patient had been rejected for life insurance because of suspected pulmonary trouble. Dr. Gibson said that in one of his cases, which he was unable to show, the condition was bilateral.

DR. KAMMERER said that about thirteen years ago he showed a case to this society, in which he had removed a cervical rib that had caused serious pressure symptoms, evidently producing a thrombosis of the brachial artery or its branches. The pulse in the vessels of the arm was absent before operation and had not returned some time after a portion of the rib had been removed. All the symptoms referable to pressure on the plexus were, however, permanently relieved in his case.

#### SARCOMA OF CLAVICLE—EXCISION FOLLOWED BY TOXIN TREATMENT.

DR. WILLIAM B. COLEY presented a boy, twelve years old, who came to the Hospital for the Ruptured and Crippled on December 16, 1912, with the history that five weeks previously he had fallen off a stepladder and struck the region of the right clavicle against a wooden box. Two weeks later a swelling appeared on the inner extremity of the right clavicle; it was painless, apparently attached to the bone and had rapidly increased in size.

Examination on December 17 showed a tumor, about the size of a hen's egg, markedly protuberant in the region of the sternum and right clavicle. It apparently involved the inner half of the clavicle and occupied the entire suprasternal region. It was soft in consistence, almost fluctuating in some parts, denser in others. The skin was not adherent, but the superficial veins were considerably dilated.

Dr. Coley said he made a clinical diagnosis of periosteal sarcoma of extreme malignancy, and advised total excision of the clavicle. The X-ray photographs showed almost complete destruction of the inner third of the right clavicle. The operation was performed on December 20, 1912, an incision being made

until January 3, 1913. Through an anterior incision between the deltoid and the pectoralis major muscles the head of the bone was exposed surrounded by an adventitious capsule. There was a healed fracture extending partially through the tuberosities, and a fracture of the anterior inferior edge of the glenoid cavity, which fragment was removed. The capsule was closely adherent to the surface of the glenoid cavity and had to be stripped away from it. The pectoralis minor and coracobrachialis muscles were divided transversely, but the head of the bone could not be brought into its normal relation with the glenoid cavity until some of the anterior and outer fibres of the capsule were also incised, when reduction could be effected, and the capsule was then repaired around the head of the bone. The coracobrachialis was sutured, the pectoralis minor was not. The long head of the biceps tendon was not recognized, and probably not divided. A rubber drain was inserted and the wound was sutured. The arm was dressed in the Velpau position, in which position there was less tendency for the head of the humerus to slip out of its socket.

The operative result of this case is very gratifying. An X-ray made three weeks later showed the reduction to be perfect (Fig. 2). At the present time, although the patient has had no systematic massage, the restoration of function is progressing rapidly. The patient uses her arm without pain, and is doing some work. There is still marked limitation of abduction, partly compensated by movement of the scapula, but this limitation is decreasing quite rapidly and there is every reason to believe that the final result will be a highly satisfactory one.

Dr. Jopson further remarked that A. F. Jonas reports 11 cases of old dislocation of the shoulder-joint, of which 9 were treated by open incision, reduction being effected in 7 of these, while in 2 the head of the humerus was excised. Hotchkiss operated on 8 cases, reducing 5, after arthrotomy, and resecting 3. In these old dislocations of the shoulder which are not reducible by bloodless manipulations, and this should nearly always be given a trial, arthrotomy offers about 75 per cent. of chances of reduction, while in the remaining 25 per cent. excision will be necessary. The anterior method of approach, either in the pectorodeltoid interspace or as Hotchkiss prefers, transverse division of the fibres of the pectoralis major (Andrews), is the

Dr. Coley said his first case of round-celled sarcoma of the clavicle in which he performed total excision was shown at a meeting of the New York Surgical Society about two years ago. That case bore a striking similarity to that shown to-night in the fact that it followed almost immediately after a trauma. In that case the injury was not a direct blow, but a severe strain caused by the patient trying to save himself from a fall by catching hold of the stair-banister with his left hand. The tumor in that case, apparently, was of periosteal origin, and about the size of an English walnut. There was no pain until about three weeks before the operation. Before leaving the hospital the patient was put upon the mixed toxins of erysipelas and bacillus prodigiosus, and the treatment was continued in small doses by his family physician for three months longer. At the present time, nearly three and a half years later, the patient remains in good health and an important engagement prevented him from being present this evening.

Dr. Coley said that of the ten cases of sarcoma of the clavicle that had come under his personal observation, eight gave a distinct history of an antecedent trauma. Sarcoma of the clavicle was apparently one of the most malignant of all new growths. Norkes, in 1893 (*Beitr. z. Klin. Chir.*, Bd. xi, p. 729), was able to collect 32 cases of total excision of the clavicle for malignant disease, to which Dr. Coley, in his paper read before the American Surgical Association in 1910, was able to add 20 further cases found in the literature, and twelve unreported cases, including one of his own.

As to the results, eleven of the cases died of the operation. In seven a recurrence was noted within the first six months after operation. Only six were well at the time of observation. Only three of the 64 were known to have been permanently cured, one fifty years, one ten and one five years. (The case of Dr. Delatour, well five years after excision, had escaped Dr. Coley's notice when he published his paper.)

Since the publication of his paper in 1910, the number of cases well beyond three years had been somewhat enlarged. His own case had now remained free from recurrence for over three years; the case reported by Dr. Maurice H. Richardson, of Boston, was well over five years, and the case of Dr. Thomas W. Huntington, of San Francisco, was well four and a half

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made in the pectoral region. A week later an exploratory incision was made in order to obtain material for microscopic examination. This was submitted to Dr. Ewing, who reported as follows:

I think the tumor of the palate must stand as an adenocarcinoma. It is made up of small alveoli lying in hyaline or mucoid struma. Most of the alveoli are intact; some are carcinomatous and diffuse. The tumor probably arises from the mucous glands of the palate. It is not at present very malignant, and a thorough extirpation ought to cure.

The mixed toxins were continued locally and systemically, and under this treatment the tumor showed marked diminution in size and became less diffuse and more discrete, so that its outline could be more easily defined. It also became harder in consistence, so that the needle entered with difficulty. The local injections produced fairly severe reactions, a temperature of from  $102^{\circ}$  to  $104^{\circ}$  being obtained with from one-third to one-half mm. doses.

In view of the decrease in size of the tumor, the patient was operated on August 1, 1912, under ether anesthesia and after preliminary ligation of the external carotid. Through an oblique incision through the soft palate, two and a half inches long, an attempt was made to remove as much as possible of the growth. It was about the size of a small egg, fairly well encapsulated, and extended backward and downward for about two inches. It was found impossible to remove the capsule, and the curette and scissors had to be employed. The wound healed rapidly and the patient was sent to the country for two weeks to recuperate, after which he resumed his occupation.

An examination, made on April 7, 1913, showed nothing but scar tissue at the site of the wound. The toxins had been continued, twice weekly, by his family physician, which in no wise interfered with the patient's occupation. His general condition is good, and he now weighs more than at any previous time.

A second microscopic examination, made by Dr. Ewing, confirmed the diagnosis of adenocarcinoma.

DR. HOWARD LILIENTHAL said his experience with Coley's fluid, both in inoperable sarcoma and as a post-operative precaution against recurrence in carcinoma, had convinced him of

DR. JOHN H. JOPSON reported that this patient was pretty well satisfied with the result of this arthroplasty and he thought it would be a step backward to leave these patients without operative treatment. There is no reason why in an old dislocation of the shoulder, in addition to the restoration of function, one should not aim to relieve the pressure on the brachial plexus and to relieve the circulatory disturbances and this can only be effected by reduction or excision.

#### MIXED CELLED SARCOMA OF THE LOWER LIP.

DR. L. H. LANDON, in reporting a case-history, remarked that the occurrence of sarcoma of the lip is apparently extremely rare, although a considerable number of cases have probably been overlooked and taken for epithelioma because of its rarity, difficulty of diagnosis, and lack of, or improper microscopical examination. None of the standard text-books make reference to it, except the 1898 edition of *Duplay and Reclus' Surgery*, in which its rarity is commented upon and two cases reported in both of which there is reason to believe that the growth was primarily of the gum with involvement of the lip. One of these cases, seen by Vidal, was of the melanotic variety, the other reported by Suttegast was mixed celled.

Except for these two cases, a careful review of the literature has revealed but nine cases, only three of which were proven to be true primary sarcoma of the lip.

In 1897 (*New York Post-Graduate*, 1897, vol. xii, p. 346), Coley, in a clinical lecture, showed a little girl aged five. In September, 1896, there was first noticed a small spot resembling a mosquito bite  $\frac{1}{2}$  inch below the mucocutaneous line on the right side. Four months later, although not regarded as malignant, it was removed and the specimen preserved in alcohol. In October it began to reappear and an examination then made of the previous specimen showed a round-celled sarcoma. It was then about the size of a pea and markedly indurated. A wide excision was done with recurrence a few weeks later in the scar. Feeling further operation of no avail, she was brought to Coley for treatment with his toxins with later excision of the scar. In April, 1897, the child was free from recurrence.

The second case was reported by Maunsell in 1899 (*Trans. Royal Acad. Med., Dublin, Ireland*, 1899, vol. xviii, p. 326), a mixed celled sarcoma in the lower lip of a female of thirty-two years. It was of three months' duration with no metastasis.

In discussing this case, E. J. McWeenly mentioned a case of

### OMENTAL GRAFTING TO REPLACE SEROSA AND MUSCULARIS OF SMALL INTESTINE.

DR. MOSCHCOWITZ presented a man, twenty-one years old, who was admitted to the Mt. Sinai Hospital on March 3, 1913, with the indications of an acute appendicitis. He was immediately operated on by the house surgeon, who, upon opening the abdomen, had considerable difficulty in finding the appendix, and encountered at least four discrete abscesses, which were opened. Dr. Moschcowitz, who was awaiting the progress of the operation, noticed an adherent loop of small intestine, fully six inches in length, which was exposed in the wound, still attached to its mesentery, but absolutely devoid of any serosa or muscularis. He thereupon took charge of the operation personally, and found that the appendix was situated retrocæcally. As the outlook of a resection of devitalized segment of the intestine in such an infected field and with such extensive adhesions did not seem very promising, he brought into the field of operation a liberal portion of the omentum, and with it completely covered up the denuded loop, fastening it both in front and behind and at its two extremities with a few interrupted catgut sutures. The wound was drained with gauze, tubes and a rubber dam, but all disposed of in such a manner that nowhere did the gauze come in contact with the denuded loop of intestine or its new omental covering.

The patient was kept constipated for the first four days, and thereafter the bowels were moved with enemata. Gradually, all drainage was removed. There was no leakage, and no interference whatsoever with the bowel functions; in fact, the patient's convalescence was absolutely perfect in every respect, and he was discharged on April 6, 1913.

Dr. Moschcowitz said this case was presented in connection with the case of ileus which he showed two or three months ago, where the condition was caused by the tearing away of about four inches of small intestine from its mesentery. In that case, the intestine evidently remained viable through the influence of the omentum that had become adherent to it, but eventually, by cicatrization, the bowel had become contracted to such a degree that intestinal obstruction had occurred. The present case was a further example of how a loop of intestine could be kept viable by omental grafting. This patient would be kept under

with death in nine months. Autopsy showed no distant metastasis. The pathological report was uncertain as to whether it was a melanotic sarcoma or a carcinoma-melanodes but as it was composed of alveoli containing epithelial cells with only slight stroma some of the cells of which were pigmented, it corresponded very closely to the description by Kaposi in *Die Hautkrankheiten*, of carcinoma-melanodes, and was probably such.

Eugene Hodenpyl (*Proceed. New York Path. Soc.*, April 8, 1891) presented a microscopical specimen of a tumor removed from the upper lip of a man aged fifty. Five years before a pimple had appeared. It was removed two years later and soon after the present growth occurred. The microscopical findings in this case were remarkable as different portions of the tumor presented respectively, myxomatous, cartilaginous, glandular and sarcomatous tissue, the connective tissue being principally derived from the fibrous capsule.

Prudden said in discussing this case, that hand in hand with the proliferation of the glandular elements, it was not unusual to have a simple hyperplasia of the fibrous tissue. Myxomatous tissue is closely allied to sarcomatous and when hyperplasia is added to this, the difficulty of differentiating it from sarcoma is rendered still greater.

Dr. Landon's attention was first called to this subject by a patient under the care of Dr. Frazier at the University Hospital to which he was admitted October 3, 1912. The patient, an elderly man of 76 years, gave the following history: About two years before he had been stung by an insect at the site of the present sore. A small lesion resembling a fever blister had resulted which under simple treatment seemed to heal only to break out again repeatedly until about four months ago, it began to enlarge and the surface became ulcerated. It had given him no pain. Other points in the history were negative. He did not use tobacco at all and alcohol only moderately.

Upon examination, there was presented a poorly nourished elderly male with the usual evidences of senile changes. Careful examination failed to show any changes other than those incident to his age except in the affected region. On the lower lip, near the mucocutaneous junction and close to the midline was a rounded mass about one and one-half centimetres in diameter, the ulcerated surface of which was covered by a dirty scab, the removal of which left a freely bleeding irregular surface. The base of the growth was indurated; the growth was not tender, and did not extend to or involve the gums. In many respects the growth had the appearance of an epithelioma and was so regarded until the pathological report was received. The

The patient was a painter, forty-two years old, of prematurily senile habits, who, six and a half months before admission to the hospital, sustained a fracture of both the tibia and fibula. Ever since then his limb had been encased in plaster of paris, which was applied at another hospital. The leg was encased in several layers of crust and dirt, beneath which two ill-conditioned, retracted granulating defects existed. The tibia showed good apposition, with no longitudinal displacement, while the fibula showed both lateral and longitudinal displacement. There was marked false mobility, and the X-ray showed no traces of a callus.

By the condition of the leg, any bloody procedure of osteo-plasty was rendered extremely hazardous, while it was easy to prepare sufficient space for the performance of a subcutaneous procedure was carried out: By previous acupuncturing needle, the exact site of the fracture was established; this needle was left inserted between the two trial fragments and served as a guide for the proper placement of the incision. Then, with a ordinary aspirating syringe, armed with a stout needle, about

Dr. APPAD G. GERSTER, in presenting this case, said experience with compound fractures in the human, as well as in experimental work on animals, had amply shown that the presence of effused blood about the fragments played an important part in the formation of an adequate callus. Based upon this circumstance, Bier had recommended the injection of fresh blood in tarry union after fractures. This treatment was so simple, and in the case shown had such a good result, that it was deemed to be worth while to present it to the Society.

BLOOD INJECTION FOR CURE OF UNUNITED FRACTURE.

Histologically, the wall of the cyst was found to consist of dense connective tissue, containing abundant young connective tissue cells, fibroblasts and plasma cells. The inner lining of the cyst consisted of granulation tissue containing many newly-formed blood vessels. There was no epithelial lining to the cyst. In one or two of the sections taken from the neighborhood of the pedicle, distinct pancreatic alveoli were found.

layers, without damage. The patient made an uninterrupted recovery, and was discharged on March 9, 1913.

two months had elapsed since the first operation, the progress of the disease had been so rapid that the case was regarded as hopeless and no attempt was made to attack the opposite side.

Pathological examination of the tissue removed as at the first examination showed mixed celled sarcoma of the lymph nodes, the growth appearing to be extremely active.

The patient was discharged from the hospital on December 25, but from then on the rapidity and virulence of the growth were much more marked. The upper lip, tongue, and floor of the mouth became extensively involved and he died on March 3, with still no clinical evidences of distant metastasis.

In considering these cases, three facts stand out prominently; their slowness of growth and apparent insignificance up to the time of operation with little or no systemic effects; their quick recurrence, with greatly increased virulence, following operation; and their apparent localization with no distant metastasis even up to the time of death.

Whether or not in this case the continuation of the lymph metastasis and the eventual outcome of the disease, would have been influenced by a more painstaking and thorough block dissection of the neck, is quite problematical. There was not in this case as in some of the others recorded, any local recurrence but rather an extension to other lymph node groups. In a lymphosarcoma, we are dealing with one of the most malignant of tumors, a lesion in no wise comparable to that of epithelioma and had the true nature of the lesion been known before the operation, the course pursued might have been modified.

W. J. Mayo (*Jour. A. M. A.*, Feb. 15, 1913) particularly has called attention to the danger and frequency of the traumatic dissemination of malignant disease during operative manipulations, especially those in the breast, gastro-intestinal tract, and female pelvis. Wherever during the removal of malignant growths, it becomes necessary to preserve contiguous structures which are approximated or surrounded by the disease, one cannot expect to separate them or preserve them without carrying and spreading the malignant infection throughout the wound. There is no more favorable seat for this traumatic dissemination and grafting than in the cervical region, where certain important structures must be preserved. The use of the cautery knife is claimed by some to be effectual in preventing the dissemination

Dr. GERSITER presented a man, thirty-one years old, who entered the hospital with typical symptoms of a ureteral calculus, a calculus being confirmed by X-ray and ureteral catheterization. On November 16, 1912, by ureterolithotomy, a

URINARY INFILTRATION AFTER RETROPERITONEAL URETEROTOMY.

On March 6, 1913, two semi-elliptic incisions were made cir-  
cumsciribing both the epigastric hemia and the umbilicus, and  
penetrating all the components of the abdominal wall. The  
hemial contents, consisting, as usual, of parts of the round he-  
mial ligament, were replaced. Then the two incisions were  
united below the navel, and the cut line was extended downward  
the navel, widening gradually like a funnel into the full size of  
the bladder; in fact, that this funnel represented the fundus.  
This we might say that the bladder opened directly into the  
navel unless the umbilical end of the funnel were to be accepted  
as the urachus. The navel was severed from the top of the  
bladder directly below the skin, where the calibre of the funnel  
was about two millimetres. This was bent upon itself, depressed,  
and buried under three tiers of catgut sutures. Then the ab-  
dominal parietes were closed by the usual layer sutures. A  
small drain was placed against the apex of the bladder and with-  
drawn on the third day. For a few days the bladder and with-  
erized every six hours. Primary union followed. A skin graft  
of the bladder filled with collagen showed that the fundus had  
now resumed a normal dome-like shape.

PATENT URACHUS AND EPIGASTRIC HERNIA.

## TUBERCULOUS CERVICAL LYMPHADENITIS. 551

patient was blue in the face from the sudden shutting off of the return flow from the head, and remained in a comatose condition for several days. He had also seen cases where nerves have been injured; one girl at the first operation had the hypoglossal cut and at the second operation the long thoracic nerve.

He is a firm believer in the value of operative treatment in all cases, and at the meeting of this Academy in November, 1908, he reported a case of his own in which temporary paralysis of the left vocal cord followed an extensive operation for tuberculous cervical adenitis; but except for this instance, from which recovery was complete, he has not had the misfortune so far to injure any of the cervical nerves at operation, except sometimes the branch of the facial to the depressor anguli oris.

DR. CHARLES H. FRAZIER thought that Dr. Müller had brought out two important points, first that this condition of tuberculous lymphadenitis is a major condition requiring a major operation and should not be left to the end of a long clinic when the operator is tired out, but should be done when the surgeon is fresh. Secondly, and perhaps most important, is the selection of the time for operation. On so many occasions patients are referred to the surgeon with broken down areas, with mixed infection, it is expected that not only the abscess cavity will be evacuated but that at this time also the lymph nodes will be removed. Dr. Müller has referred to the undesirability of operating at this time; the abscess cavity should be evacuated but the radical procedure should be postponed until this cavity has become obliterated or converted into a simple sinus.

DR. EMORY G. ALEXANDER said that he had used for the past three years at the Mary J. Drexel Home for Children, the tuberculin treatment. The results had been most gratifying and it has reduced the number of operations considerably. In all the cases any source of infection in the mouth, throat and nasal passages, such as carious teeth, hypertrophied tonsils and adenoids were removed, and then the patients were given general hygienic treatment, syrup of iodide of iron, and tuberculin. Of course, the question is open for argument that it is the hygienic treatment, the removal of the source of infection, etc., and not the tuberculin that produces the result; but they never got the results they are getting to-day until they began the

Later, broad drainage was established by the resection of short segments of the seventh, eighth and ninth ribs. The cavity had two compartments, one running forward and upward, the other backward and upward toward the spine. Gradually, the division between them increased, but the boy's general condition became worse and fever diminished, but the boy's general condition did not improve. On December 14 the fever again rose, together with an increase in the flow of pus, and three days later short segments of the fourth, fifth and sixth ribs were resected in the space between the spine and the inner edge of the scapula, exposing the tract leading upward and inward. A thick coat of organized exudate covered the lining. Funiculation being evident, this coat was incised, when a huge cavity, easily admitting the finger, was opened, from which there escaped about a pint of pus. This probably represented an interlobar deposit. Immediately, the patient's temperature fell, and improvement of the general condition became noticeable.

TRANSACTIONS  
OF THE  
NEW YORK SURGICAL SOCIETY.

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*Stated Meeting, held at the New York Academy of Medicine,  
April 9, 1913.*

The President, DR. CHARLES L. GIBSON, in the Chair.

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CHYLO-ASCITES OF TRAUMATIC ORIGIN.

DR. HOWARD D. COLLINS presented a boy, white, nine years old, who on December 13, 1912, was struck by an automobile. He was brought to the J. Hood Wright Hospital, but his parents wished to take him home, and as no lesion was found, he was allowed to go. He was brought back two days later complaining of some abdominal tenderness, with moderate pain and distention, and a temperature of  $102.4^{\circ}$ . Within two days his symptoms subsided and he returned home.

The boy was readmitted to the hospital on March 11, 1913, with the history that since December 18, 1912, there had been slight but persistent abdominal distress, with increasing distention and marked loss of weight and strength. Upon examination, the abdomen was found to be much distended by fluid, and in the absence of other signs the case was regarded as one of tubercular peritonitis.

Operation, March 12, 1913: Through a median incision, a large quantity (perhaps 30 ounces) of a white fluid escaped from the general peritoneal cavity, and a loop of small intestine which was exposed showed every chyle radical enormously distended. Upon further exploration, a cystic retroperitoneal tumor was found in the region of the pancreas, and upon incising this, about sixteen ounces of a clear, coffee-colored fluid escaped. The mouth of this sac was sutured to the edge of the incision, and drained with gauze. The boy made an uneventful recovery from the operation, but the abdominal distention recurred and

detected in the left fornix. Upon further questioning, it was elicited that the patient had had attacks of pain in the left side, and troubled with urination. The latter symptoms had apparently disappeared.

An X-ray, taken the following morning, revealed an oval shaped calculus in the left ureter, just above the bladder, associated with two phleboliths. Upon cystoscopy, the urine from the left ureter was sterile, while that from the right contained epithelial cells, pus and colon bacilli.

The patient refused operation and left the hospital. A year later she returned and requested that the stone be removed, as she was now having considerable pain in her left side. A second X-ray examination revealed the same condition as a year ago. Catheterization of the right ureter showed the urine to be sterile, while that from the left side showed evidences of colon infection.

The ureteral stone was removed through Gibson's extraperitoneal incision, and two phleboliths were removed from the base of the broad ligament.

At the time of this patient's first admission to the hospital, the picture was that of a right pyelitis, closely simulating appendicitis. The finding of the left ureteral stone was accidental, as at that time the stone was giving no symptoms. On her second admission, the picture had entirely changed: it was that of a stone in the left ureter, with superadded colon infection and a clear right kidney. Without the ureteral findings, the pain on the right side would doubtless have been regarded as reflex, and the case would have been classed as one in which the stone was on one side and pain on the other.

#### BONE TRANSPLANTATION FOR POTT'S DISEASE.

DR. LYLE presented a man, forty-eight years old, a patient at St. Luke's Hospital, who was suffering from pulmonary tuberculosis and tuberculosis of the sixth and seventh dorsal vertebrae. The history, physical signs and X-ray findings were those of acute Pott's disease.

Operation: A bow-shaped incision was made, extending from the fourth to the tenth dorsal vertebra. The fascia and muscles were separated in mid-line, over the tips of the spinous processes. The spinous processes of the fourth to the ninth dorsal

mesentery of the ascending colon were much enlarged. The appendix and the ileo-caecal valve were not involved.

A resection of the ascending colon was done from a point two inches proximal to the ileo-caecal valve to three inches distal to the hepatic flexure, with end-to-end anastomosis. The abdominal wound was then closed.

Upon splitting up the excised segment of the colon, it was found to contain many thread worms (*oxyuris*), with evidences of beginning gangrene at the point of intussusception. The patient made an uneventful recovery, and left the hospital on April 9, 1913.

#### DOUBLE PERFORATION OF THE DUODENUM.

DR. CHAS. L. GIBSON showed a man, twenty-seven years old, of temperate habits, who was admitted to the New York Hospital on February 7, 1913, with the history that for two years past he had been suffering from gastric disturbance, characterized chiefly by pain in the epigastrium, with considerable nausea and occasional vomiting. On the morning of the day of his admission he had had a sudden, sharp pain in the epigastric region and went into a collapse. When Dr. Gibson first saw him, about eight or nine hours later, he complained of intense abdominal pain, but there was nothing definite upon which to base the diagnosis of intestinal perforation.

Upon opening the abdomen, two actively discharging perforations of the duodenum were found, one at the pylorus, the other about an inch lower. They were both closed with purse-string sutures, and although these seemed to give rise to a slight constriction, Dr. Gibson said he refrained from doing a gastro-enterostomy, which he thought was seldom indicated in dealing with these acute cases.

The man made a perfectly normal recovery, and left the hospital in ten days. At that time he was eating solid food and was entirely free from gastric symptoms. Whether a gastro-enterostomy would eventually become necessary in this case remained to be seen.

#### CERVICAL RIB.

DR. GIBSON showed two cases of cervical rib, one in a male, the other in a female. The speaker said he had seen four examples of this anomaly in a comparatively short space of time.

mass of adhesions. The patient was in such a wretched condition at the time that nothing further could be done. Less than a month later, however, he had improved to such an extent that the abdomen was reopened and pylorectomy done. This proved extremely difficult on account of the adhesions. It was interesting to observe the extent to which the Finney pyloroplasty had shrunken, so that it would scarcely admit the end of a probe. The patient made a good recovery. He had regained his natural weight and now felt perfectly well.

In connection with this case, Dr. Lilienthal said he again wished to speak of the advisability of doing these operations in two stages. In this case, the patient could not have withstood the complete operation at one sitting.

DR. EUGENE H. POOL, who was present at the operation in the case shown by Dr. Lilienthal, said the pylorectomy was made unusually difficult by the dense adhesions. It was interesting to note the contraction of the stoma which had been made at the time of the original Finney operation. This, Dr. Pool thought, was rather unusual, and should not militate against the adoption of the method in future cases where it was indicated.

DR. GERSTER said that in doing a pyloroplasty, a large aperture did not insure against its closure. There was no aperture so large that it could not close, and on the other hand, an artificial closure of the pylorus could not be guaranteed to remain closed permanently. This fact was recently demonstrated in a case reported to the Society by Dr. Moschcowitz, where, after resection of the pylorus, followed by closure of both the stomach and duodenum by multiple sutures, communication was re-established between the stomach and duodenum.

In the case shown by Dr. Lilienthal, the speaker said, it was possible that a secondary peptic ulcer developed around the Finney aperture, with the formation of cicatricial tissue and contracture. In establishing a communication between the stomach and jejunum and excluding the duodenum, the surgeon, while he has accomplished something, has not cured the hyperacidity which gave rise to the original ulcers.

#### DUODENAL KINK.

DR. SYMS presented a woman, twenty-eight years old, who was admitted to the Lebanon Hospital on December 25, 1912.

beginning just above the sternum, over the inner junction of the tumor, and carried around to the outer extremity of the right clavicle, down to the normal bone, and the clavicle was then sawn through about two inches from its outer extremity. Lifting up the inner portion by means of a lion-tooth forceps, the tumor was carefully dissected from its deep attachments. There was practically no bleeding. The growth was extremely soft in areas, and a small portion of it exuded through the wound. There was very slight shock. The wound was closed, with cigarette drain.

The specimen was submitted to Dr. James Ewing, who reported as follows:

Specimen consists of clavicle which fractured about the middle point, where it runs directly into the tumor mass. Periosteum strips easily; shaft of bone is eroded beneath it. The outer end of clavicle is largely destroyed by tumor growth, which has split up layers of periosteum and bone shaft, and invaded the surrounding muscle for a distance of one-half cm., producing a rounded tumor in this region.

The gross appearance is not distinctive of either central or periosteal sarcoma. The outer end of the bone is much thickened, and the bone is irregularly absorbed. Through the centre of the globular mass of tumor runs a sharp, white line, indicating periosteum, beyond which the tumor infiltrates muscle and fat.

*Histology.*—The tumor belongs in a class commonly called small, round-celled sarcoma. The cells are small, 10-12 micr. in diameter, with poorly defined cytoplasm, hyperchromatic vesicular nuclei. The shape, where preserved, is polyhedral; cell bodies are clear; arrangement is diffuse, the cells often sheathing numerous small blood vessels. Size of cells remarkably uniform. One large artery is filled by mural tumor thrombus. Muscle extensively invaded and destroyed by diffuse focal growth of tumor cells. Histological indications are highly malignant. Exact source of the cells undetermined.

Ten days after the operation there was a marked swelling at the site of the old tumor, having every appearance of a local recurrence. The patient was then put upon the mixed toxins, which were continued daily until a reaction of 102° or 103° F. was obtained. At the end of two weeks the swelling had disappeared, and there had been no return. The toxins were continued for two months, and then the treatment was left off for two weeks, during which interim the patient gained rapidly in weight. The toxins were then resumed, and the second period of treatment terminated a week ago.

**SUPPURATING HYDATID CYSTS OF THE LIVER, SUB-PHRENIC SPACE AND PLEURAL CAVITY.**

DR. PARKER SYMS presented a woman, thirty-three years old, who was admitted to the Lebanon Hospital on November 14, 1910. Her previous history had no bearing on her present condition, which dated back about a month before her admission, when she began to suffer from a dull pain in the back and in the right side of the abdomen. This had gradually become more aggravated, and the patient had rapidly been losing flesh and strength. There was considerable elevation of temperature, with rapid pulse. There was no history of chills. The right lobe of the liver was palpable and tender.

**Operation:** Through a right rectus incision the liver was exposed. The gall-bladder was shrunken, but otherwise normal in appearance. There was a small nodule at the edge of the right lobe of the liver which was found to contain pus; it was evacuated and packed with gauze. There was also a large mass in the dome of the liver, which was aspirated, evacuating a greenish fluid. Upon incising it, there was removed a large quantity of bile-colored fluid containing pus and hundreds of collapsed daughter cysts.

After this operation, the patient improved temporarily. Then her temperature, which had dropped to normal, again became elevated, with rapid pulse. She lost strength and showed evidence of fluid in the pleural cavity. On April 6, a right intercostal thoracotomy was done, and a quantity of greenish fluid evacuated. About a month later the ninth rib was resected to secure more efficient drainage of the pleural cavity and sub-phrenic space.

The patient's improvement was slow, but after prolonged drainage she made a complete recovery. She was discharged on June 8, 1911, and has since remained in perfect health.

**FRACTURE-DISLOCATION OF THE SHOULDER-JOINT:  
EXCISION OF THE HEAD OF THE HUMERUS.**

DR. SYMS presented a man, twenty-seven years old, who was admitted to the Lebanon Hospital on January 8, 1912, with the history that one week before admission he had slipped and fallen, striking with much force on his right shoulder.

years. It was interesting to note that in the three latter cases the toxins were used for a considerable period after operation.

The further experience with sarcoma of the clavicle and the longer period of observation of after-results only tended to still further confirm the conclusions which Dr. Coley said he had expressed in his paper in 1910; these were:

1. That primary sarcoma of the clavicle, while a rare condition, required very early diagnosis and very radical treatment—total or partial excision as soon as the diagnosis had been made.
2. That the mortality of the operation performed under modern aseptic conditions should be very small.
3. The danger of early local or general metastases was very great.
4. In view of the favorable results obtained in the few cases of sarcoma of the clavicle, and the much larger number of sarcoma of the long bones in general by the use of the mixed toxins of erysipelas and bacillus prodigiosus immediately after operation as a prophylactic, such use would seem to be strongly indicated as a routine measure.

#### INOPERABLE ADENOCARCINOMA OF THE SOFT PALATE, RENDERED OPERABLE BY THE USE OF THE MIXED TOXINS.

DR. COLEY presented a man, fifty-two years old, who was referred to him by the late Dr. William F. Dudley, of Brooklyn, on June 1, 1912. The patient had always been well until six months before, when he noticed a swelling just behind the soft palate. This was treated by Dr. Dudley, but the growth continued to increase in size.

When Dr. Coley saw the patient, in June, 1912, the soft palate was pressed forward, bulging into the cavity of the mouth. The space behind the palate was practically filled by a large tumor which interfered considerably with speech and swallowing. On palpation, a smooth, rounded tumor was found; it was moderately firm in consistence, situated behind the soft palate and extending backward, but its point of origin could not be made out. The patient was admitted to the General Memorial Hospital two days later and was put upon the mixed toxins, the injections being

He could move it in all directions, and while he could easily place his hand on top of his head, he could not raise it high above his head, there being a deficiency in the action of the deltoid.

DR. GERSTER asked if there was any reason why the head of the humerus was not saved in the two cases shown by Dr. Syms? There was no compound fracture, and according to the experience of Dr. Murphy, of Chicago, who had published a series of these cases, it might have been worth while to follow his example and liberate the upper fragment and nail it into the glenoid cavity. Even in a case where the head was disconnected, it apparently did not act as a foreign body, providing there was no infection. Dr. Gerster said that personally he had had no experience with this method.

DR. SYMS said that in the two cases he had shown, he had refrained from replacing the head of the humerus after excising it, for the following reasons:

When he operated on the first case he did not feel sufficiently familiar with the method, but was familiar with the good results obtained in these cases by removal of the head of the bone. This fact and his success with the first case prompted him to treat the second case in like manner.

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its value. In a case of lymphosarcoma of the ileocæcal region where he resected the malignant growth and did an ileocolostomy, and where complete extirpation of the involved tissues was manifestly impossible, Coley's fluid was used as a post-operative measure, and the man apparently entirely recovered. Four years later he developed a lymphosarcoma of the left tonsil, which was operated on by Dr. Charles A. Elsberg, who removed as much of the involved area as possible. The patient was again put on Coley's fluid, and he again rapidly improved in health and had now remained well for two years.

These and other similar experiences, Dr. Lilenthal said, had convinced him that this method of treatment had not received the credit it deserved.

#### HYDROCELE OF THE TUNICA VAGINALIS: TWO RECURRENCES AFTER THE WINKELMANN OPERATION.

DR. A. V. MOSCHCOWITZ presented a boy, eleven years old, who was operated on for a hydrocele of the tunica vaginalis at a hospital in a neighboring city five years ago; the condition soon recurred and three years later he was again operated on by the same surgeon, and again the operation was followed by a rapid recurrence.

Dr. Moschcowitz operated on the boy at the Har Moriah Hospital on March 21, 1913. On account of the two preceding Winkelmann operations, the third operation was exceedingly tedious and difficult, but he finally succeeded in extirpating all of the parietal serosa. At the same time he extirpated an empty hernial sac which extended into the scrotum, and closed the inguinal canal in a radical manner.

This case, Dr. Moschcowitz said, was presented in connection with a discussion of this subject which took place before this Society on November 8, 1911, when Dr. H. H. M. Lyle presented a case of hydrocele in which a recurrence had taken place after the Winkelmann operation, and had referred to three additional cases out of a series of ten in which there had been recurrences. At that time, some of the members who were present spoke against the Winkelmann operation, while others favored it.

chain after falling two stories struck on the shoulder of an ironworker.

Reference to the anatomical relations of the cervical spine, the shoulder, and the roots of the plexus as they run obliquely across the base of the neck makes it evident that in these forcible separations the strain first comes upon the upper roots of the plexus, then, as they give way, upon the next lower roots, and so on until the entire plexus is ruptured.

Before the nerve-roots themselves give way the deep cervical fascia which lies just in front of them tears, the nerve sheaths rupture, and finally the nerves themselves yield. Combined with these torn fibrous and nerve tissues is the blood-clot resulting from the injured vessels. After a time these elements organize into a cicatrix which prevents the passage of nerve impulses and the regeneration of the nerve fibres.

This cicatrix may involve only a part of the upper root, may involve the entire plexus, or may stop at any point between these two extremes. There may be several cicatrices scattered about the roots.

One or more of the roots may be entirely torn across, the ends dislocated and firmly adherent by cicatricial tissue to neighboring structures. The cicatrices may run well up into the intervertebral foramina, or in certain cases the roots may be torn from the cord itself.

As previously stated, the injury in these cases practically always involves the roots in order from above downward, so that the major effect is in the upper roots and shades off in those below, unless the traumatism has been sufficient to rupture the entire plexus.

The paralyzed muscles fall naturally into groups which correspond with their dependence upon individual nerve-roots for their innervation.

The majority of cases fall into the "upper arm type" in which the fifth and sixth roots are involved. The suprascapularis, infraspinati, the deltoid, the biceps, the brachialis anticus, and the supinators are completely paralyzed, while the pectoralis major is only partly paralyzed because some of its

observation, and should any complications arise, he would be glad to report them to the Society.

#### CYST OF THE TAIL OF THE PANCREAS.

DR. MOSCHCOWITZ presented a girl, thirteen years old, who was admitted to the Har Moriah Hospital on February 17, 1913. Both her family and past history were negative, and there was no history of any trauma. Ten days ago the girl began to complain of cramp-like pains in the left half of the abdomen. Upon the application of heat, these pains ceased for a time, only to recur with increasing severity. She vomited repeatedly and suffered from constipation, although her bowels could be moved with the aid of enemata.

On physical examination there could be seen and felt a large tumor which occupied the middle and lower thirds of the left abdomen. The mass was ovoid in shape and approximately the size of a large cocoanut. On account of the rigidity of the overlying abdominal muscles, its exact contour could not be well defined. It was very tense, of indefinite consistence and not very tender. It was slightly if at all movable and could be distinctly felt per rectum.

In the absence of any previous history, the diagnosis was believed to lay between a mesenteric cyst and a twisted ovarian cyst, with the probabilities in favor of the latter.

Operation, February 19, 1913: With the patient in the Trendelenburg position, through a median suprapubic incision which later had to be extended to a distance of about eight inches, it was found that the uterus and adnexa were perfectly normal. A large cystic tumor was seen extending from the pelvic brim upward and covered by adherent omentum. This was liberated from the cyst by blunt and sharp dissection. The cyst was so large and unwieldy as to preclude its extirpation *en masse*, and even its exact anatomical relations could not be definitely made out. It was thereupon aspirated, and fully two quarts of a clear fluid were evacuated. It could now be made out that the upper limits of the cyst extended beyond the stomach, into the angle formed by the pancreas and spleen, and as it was gradually freed from its attachments, the splenic vessels finally came into view as well as the tail of the pancreas, from which the final pedicle was excised. The entire wound was closed in

The sense of deep touch is least apt to be affected. Light touch perception begins to return before that of pain and temperature.

In all of these cases for many months palpation in the region of the sixth cervical transverse process will demonstrate a tender indurated mass which is the cicatrix resulting from the torn deep fascia, nerves, and blood-vessels.

In a certain few cases where the two lower roots are damaged there is an associated injury of the cervical sympathetic (see Case VI).

The course followed by these cases is fairly characteristic. When there has been complete rupture of all the roots there will be permanent paralysis of all the muscles, permanent sensory changes, R. D., marked flaccidity, and atrophy.

When there has been less than complete rupture improvement will always appear after a time, usually three months. In these cases, as the injury occurs from above downward, the lower roots are naturally least injured and therefore show regenerative power first. For this reason the improvement always begins below and progresses upward toward the shoulder. The deltoid and spinati are the last to show results.

Sensory disturbances improve much earlier than do the motor symptoms and may entirely disappear while the extremity is still useless.

Response to the faradic current reappears before much change in the galvanic polarity is noticeable and before voluntary motion is perceptible.

Finally voluntary power reappears in the lowest group of paralyzed muscles, and slowly progresses upward until it has reached the muscle groups innervated by the nerves, which have been so injured that firm cicatrices have formed and prevent nerve regeneration. Here progress ceases. This slowly progressive improvement may cover a period of two years and then the residue of permanent paralysis still be crippling in extent.

The prognosis, without operation, is distinctly bad. In five out of the six cases included in this paper lesions were

an ounce and a half of blood was directly withdrawn from the patient's median vein. The guidance of the previously inserted needle rendered prompt and precise injection of the blood very easy, so that this was accomplished before coagulation. Considerable pressure had to be used to expel the blood. The puncture was protected with a small patch of iodoform gauze, the leg being put up in plaster.

No reaction followed, and a day or two later the patient was made to walk. On February 20 there was marked lessening of false mobility. As a double hernioplasty was done on that day at the patient's request, the anaesthesia was used for depositing another ounce of fresh blood at the site of the delayed union. By March 15 the leg ulcers had healed, and the deposit of a good callus became evident. The skiagram showed an interesting condition: First, the absence of any callus whatever about the fibula, which had not received any special treatment. Secondly, an abundant, spindle-shaped callus encasing the fragments of the tibia (like a plumber's splice), the line of pseudoarthrosis between the fragments remaining clearly marked. This demonstrated that the fractured and apposed surfaces remained unaltered and ununited by bony deposit, and that the firm union of the fragments was due to an external callus.

DR. HENRY H. M. LYLE said he had used the Bier method of treatment in three cases of double fracture of the lower extremity, two of them compound. He believed that this method should always be given a trial before either bone grafting, or bone plating were resorted to, and he had seen it succeed where the latter had failed.

Dr. Lyle said that he had experienced some difficulty in carrying out the technic as described by Bier, and he now used a slight modification which made the procedure very simple. The only drawback to Bier's original technic was that the blood clotted rather quickly which in some cases interfered with the thoroughness of the work. To overcome this drawback he drew up some warm sterile albolene through the needle into the syringe and then expelled it, leaving a fine film of albolene covering the needle and syringe. This film prevented the clotting in the syringe and needle, thus allowing a careful, accurate and thorough injection of blood around and between the fractured ends. He considered this small detail a great aid in carrying out this most valuable method of treatment.

has consisted only in the division of the skin and fat pad at the base of the neck. On the other hand, if some lesion is found, it is corrected at once with the least necessary loss of time to the patient, and at the period most favorable to the regeneration of the nerve-roots involved.

In the third case of the series reported in this paper, while no lesion of the nerve-roots themselves was found, a large indurated mass of tissue lay just in front of them and caused considerable compression. What amounted to a decompression was done, and the result was a very prompt and increasing improvement with a final complete restoration of function in the extremity.

The plexus may be exposed by either of two incisions. One starts just above the insertion of the sternomastoid muscle and passes outward and slightly upward across the base of the neck following the natural wrinkles of the skin. The skin and underlying fat pad are divided in the same line. Usually the external jugular vein, the transversalis colli, and suprascapular vessels are tied and divided. With proper retraction the nerves are pretty well exposed. This wound falls together naturally and heals without any tendency in the scar to spread. Its disadvantage is that in wide-spread damage of the plexus it does not give complete exposure.

The other incision starts at the level of the transverse process of the sixth cervical vertebra and runs obliquely downward and outward to the junction of the outer and middle thirds of the clavicle and divides practically the same structures as in the preceding case (Figs. 1 and 2).

After retraction of the wound in either incision, the deep layer of cervical fascia normally lying just in front of the plexus is found thickened and adherent to the underlying nerves. This is dissected away, thus exposing the roots and plexus which are examined by sight, touch, and, if necessary, by a tiny electrode, to detect the presence of cicatrices which prevent nerve regeneration and the passage of nerve impulses.

The cicatrices are removed by transverse section of the nerves above and below at such levels as expose normal look-

was extracted from the ureter midway between the kidney and bladder. The ureter was left patent, and by inadvertence, cigarette instead of tube drainage was employed. The wound was not disturbed until the fourth day, when, on withdrawing the drainage, large quantities of turbid urine were set free, escaping from the retroperitoneal space.

Copious suppuration followed, indicating retention. Hence, on December 12, the entire wound was reopened. A channel was found leading upward toward the kidney, another directly toward the spine and a third one downward into the pelvic retroperitoneal space. By December 31 the two upper tracts ceased discharging, but not so the pelvic sinus. Per rectum, a probe introduced into the sinus could be palpated through the posterior rectal wall. To drain this pocket, the coccyx was excised, and direct drainage was established by a retrosacral incision. This incision contracted rapidly and became inadequate; hence, on March 7, 1913, the sacrum was exposed and its lower half, on a line with the third pair of sacral foramina, was chiselled through and removed. This gave free exposure to a large cavity filled with exuberant granulations and pus, lying between the rectum and peritoneum anteriorly and the remnant of the sacrum posteriorly, which was curetted and packed. By this time the incision above Poupart's ligament had closed, and from now on the discharge from the presacral cavity became scanty and serous, also closing rapidly, so that the patient was discharged, cured, on April 6, 1913.

#### PULMONARY ABSCESS; COSTAL RESECTION AND IMPLANTATION OF SCAPULA.

DR. GERSTER presented a boy, nineteen years old, who nine months before admission had had pneumonia and pyothorax, for which drainage by intercostal incision was done at another hospital, from which he was discharged three months after operation with a small sinus. This had closed and reopened several times.

When the boy was admitted to the Mt. Sinai Hospital, on November 8, 1912, he was in a wretched general condition, with hectic fever and night-sweats, and exhibiting a retracted right chest with a narrow aperture in the seventh intercostal space, from which issued a copious discharge of pus. About a week

vertebral foramina, a modified procedure is necessary. The cicatrized root may be split longitudinally up into the foramen, and if good nerve bundles are exposed above, the distal end of the nerve may be sutured into the cleft with the hope that good union will occur. If the split cicatrix does not reveal good bundles above, the only thing left to do is lateral anastomosis of the distal nerve trunk into a neighboring sound root.

In those cases where the roots have been torn from the cord, lateral anastomosis is the only thing to be done.

Where considerable lengths of nerve-roots must be resected to get beyond the cicatrices and the ends cannot be closely approximated, resort must be had to nerve bridging, or the procedure next mentioned.

Where the entire plexus is badly torn, and the freshened nerve ends cannot be brought together, a subperiosteal resection of the middle third of the clavicle will permit very greatly increased approximation of the nerve ends. This would greatly increase the chances of regeneration, and certainly an extremity with a damaged clavicle, which will nevertheless move, is very much to be preferred to an anatomically complete extremity which is permanently paralyzed.

When the proper time for the removal of the brace has arrived, the extremity may be placed in an ordinary triangular sling supported by the sound shoulder, and so adjusted as to elevate the paralyzed shoulder. The brace and sling not only prevent the paralyzed extremity from dragging on the nerve suture but also prevent the weight of the extremity from over-stretching the paralyzed muscles and thus prolonging their period of inactivity even after nerve repair has occurred.

When the change from brace to sling has been made the extremity may be given massage, passive motion, electricity, etc., every day, being taken from the sling for that purpose. Procedures which would pull the shoulder away from the neck on the operated side should be avoided for many months.

At any time after three months from operation voluntary motion may begin to appear in the paralyzed muscles, and as

and two inches from the third rib, the anterior line of the section of the ribs corresponding to a vertical line placed a little forward of the axillary line. Naturally, the resection of the three uppermost ribs was done in the axillary cavity. By removing the third rib, the extreme apex of the cavity was broadly exposed. As soon as this was done, it was very easy to return the scapula to its natural position, and then to depress and engage its inner margin under the short costal stumps that had remained attached to their spinal articulations, so that the inner scapular margin was overlapped by these costal stumps. This manœuvre filled up the gaping cavity, and brought, as it were, the subscapularis muscle into close contact with the lung surface, the divided intercostal structures offering no resistance to close apposition. A large drainage tube was placed well up to the apex of the pleural cavity, and another one under the outer reflection of the scapulomuscular flap, and then, by a series of stout, through-and-through sutures, the outer structures were closely united down to the lower confines of the field of operation. The arm was then bandaged to the chest.

Moderate reaction and suppuration followed. The suture line healed by first intention, and by March 24 everything was absolutely dry and firmly healed. Convalescence was much aided by the salutary effect of the patient's stay in the out-door ward of the hospital. He had gained over twenty pounds in weight since the operation and was stronger and more ruddy than ever.

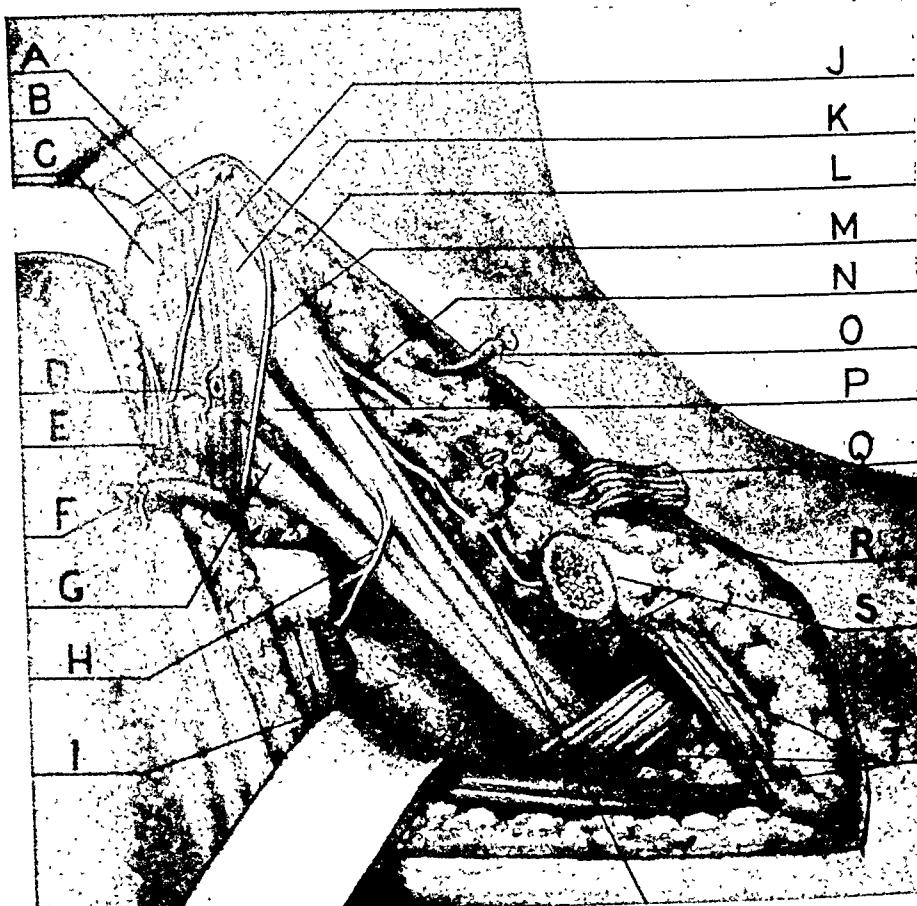
It would be interesting, Dr. Gerster said, to observe what efforts nature would make to liberate the imprisoned lung, to re-form a working pleural cavity and to readjust the thoracic deformity.

#### URETERAL CALCULUS AND PYELITIS SIMULATING APPENDICITIS.

DR. HENRY H. M. LYLE presented a woman, twenty-six years old, who was sent to the hospital a year ago by a consultant for immediate operation, the diagnosis being acute appendicitis, with which the history and signs apparently agreed. Two points, however, were suspicious: First, the point of tenderness was a little high; and, second, the temperature ( $105.4^{\circ}$ ) was rather unusual in acute appendicitis.

On vaginal examination, a stony hard, oval shaped body was

FIG. 2.



Operation for relief of brachial paralysis. A, phrenic nerve; B, scalenus anticus muscle; C, internal jugular vein; D, transversalis colli artery; E, omohyoid muscle; F, suprascapular artery; G, eighth cervical and first dorsal roots; H, muscular branch; I, subclavian vein; J, fifth root; K, sixth root; L, scalenus medius muscle; M, nerve to subclavian muscle; N, suprascapular nerve; O, transversalis colli artery, omohyoid muscle; R, suprascapular artery; S, clavicle and subclavius muscle; T, pectoralis major, pectoralis minor, and deltoid muscles; U, anterior thoracic nerve.

vertebræ were split, and the left half of each turned outward. A bone splint, eight and a half inches long, was removed from the tibia, and after being properly shaped, was placed between the spines of the vertebrae. The fascia and muscles were united over this splint by interrupted kangaroo tendon sutures.

The patient made an uninterrupted recovery, and at present shows an apparent functional and anatomical cure of the spinal lesion. The permanency of this, of course, was problematical, but the operation, in this case, had been of undoubted benefit.

#### ELBOW MOVABLE AFTER SUPPURATION.

DR. ROBERT T. MORRIS presented a man who had been subjected to some operation for "a tumor near the elbow-joint" two years previously. The nature of the operation could not be determined. The synovial cavity of the right elbow-joint had been suppurating since that time. The patient came to the Post-Graduate Hospital with a phlegmonous inflammation of the arm, and a synovial fistula dischargingropy, purulent synovial fluid. The joint cavity was opened widely and treated with a preparation consisting of 60 parts of camphor, 30 parts of phenol, and 10 parts of alcohol, at the suggestion of a member of the house staff, Dr. Hagmeir. Dr. Morris had anticipated making an excision of the elbow-joint and fixing the arm in the most serviceable position, but under the influence of this application the repair had become complete, leaving a movable elbow, with a range of movement at present extending over forty-five degrees.

#### PYLORECTOMY FOLLOWING FINNEY'S PYLOROPLASTY.

DR. HOWARD LILIENTHAL presented a man, fifty-five years old, who was operated upon by him by Finney's method in 1908 for a benign stenosis of the pylorus. A good-sized opening was made at the time, sufficiently large to admit three fingers.

The patient returned to Mt. Sinai Hospital in 1912, quite four years after the primary operation, with a recurrence of his symptoms, and much reduced in weight and strength. After a course of palliative treatment, which failed to give him relief, Dr. Lilenthal did a posterior gastro-enterostomy on January 6, 1913. At the same time he took occasion to examine carefully the region of the pylorus, which he found surrounded by a

FIG. 6



Six months after operation. Showing slight abduction  
at shoulder, and slight supination of forearm.

FIG. 7.



Six months after operation. Flexion at elbow sufficient to  
grasp opposite arm above the elbow.

After several weeks' observation on the medical side of the hospital she was transferred to the surgical service. At this time she was emaciated, weighing but 97 pounds, and highly neurotic; so much so that her case was thought to be one of hysteria. She was depressed, melancholic and emotional, and had been treated in several hospitals in this city without a satisfactory diagnosis having been made and without resulting benefit.

The patient's most obstinate symptom was vomiting, which came on soon after taking food and sometimes after drinking water. There was moderate constipation. While she was in the hospital she vomited two or three times a day and stated that this had been going on for nearly three years. During that time there had been periods of improvement, but there had never been a complete cessation of her trouble.

Examination showed that the woman was poorly nourished and emaciated, presenting the appearance of a patient with enteroptosis and neurasthenia. She had a scaphoid abdomen. There was slight tenderness in the right iliac region, but neither tenderness nor rigidity in the epigastrium. The vomitus contained partly digested food. No blood was found in the vomitus nor in the stools. The X-ray findings were negative and unsatisfactory, and failed to show any evidence of enteroptosis. Examination of the stomach contents showed very little deviation from the normal.

On January 23, 1913, through a right rectus incision, the appendix was found nearly normal, but slightly kinked. There was a pericolic membrane which, however, did not angulate or restrict the colon. This membrane was removed. There was a distinct angulation or kink at about the junction of the first and second portions of the duodenum, which was the result of peritoneal adhesions. These were cut between ligatures, and the angulation thereupon disappeared. There were no evidences of gastric or duodenal ulcer, and no apparent dilatation of the stomach.

The vomiting from which this patient had suffered for three years ceased with the operation, and it had not recurred. Since leaving the hospital, on February 14, 1913, her digestion has been entirely restored, her nervous symptoms have disappeared, and she has gained 24 pounds in weight.

The wound was closed without drainage, and the dressings were applied so as to hold the shoulder and head in close approximation. (At this time the steel brace had not been worked out.)

Healing was by primary union. The skin sutures were removed on the fifth day. On the tenth day the patient appeared with the bandages in his pocket and his head moving freely, to "give it a rest" as he said. Although the nerve sutures were probably torn out, he refused further operation but consented to being rebanded and staying for three weeks in the desired position.

He came very irregularly for after-treatment.

September 28, three months after operation, there was slight evidence of voluntary motion in the biceps, brachialis anticus, and supinator muscles of the forearm.

December 24, six months after operation, there was slight power of abduction at the shoulder, well-developed power of supination of the forearm, and sufficient flexion at the elbow so that he could grasp the opposite arm just above the elbow. He could also reach the water faucet with his left hand and turn on the water (Figs. 6 and 7). He then disappeared from observation.

CASE II.—Michael R., thirty years old. Some months before operation he had been thrown off a trolley car, landing on his head and left shoulder. There was complete paralysis of the left upper extremity. The shoulder soon became a flail-joint, to help overcome which the attending doctor had shortened the capsule of the joint.

During the few weeks preceding operation there had been some return of motion in the fingers. All the other muscles were completely paralyzed and considerably atrophied.

There was induration about the fifth, sixth, and seventh roots and the region was markedly tender.

*Operation* (June 15, 1909).—Ether anaesthesia. The exposure was the same as in Case I. The deep fascia was dissected away and exposed a hard fibrous cord running from the fifth and sixth roots down to a large cicatricial mass under the clavicle. The seventh root also showed fibrous damage. The section ran through the fifth, sixth, and seventh roots near the intervertebral foramina, through the suprascapular just after its

## FRACTURE-DISLOCATION OF SHOULDER-JOINT. 575

Examination showed a fracture of the upper end of the humerus, with dislocation of the head from the glenoid cavity. This diagnosis was confirmed by X-ray.

Operation, January 17, 1912: After freeing the head of the bone from its attachments and removing it, the shaft was replaced within the capsule of the joint. The capsule was closed as completely as possible, and the superficial wound closed, with drainage. The arm was retained in position with a modified Velpeau dressing. Motion was begun about the fourth week, and the patient was discharged on March 2, 1912.

This patient now had excellent function and was able to use his arm satisfactorily in all normal directions. There was slight limitation of the action of the deltoid, but the patient was able to lift his arm high above his head. There was evidence of some bone re-formation.

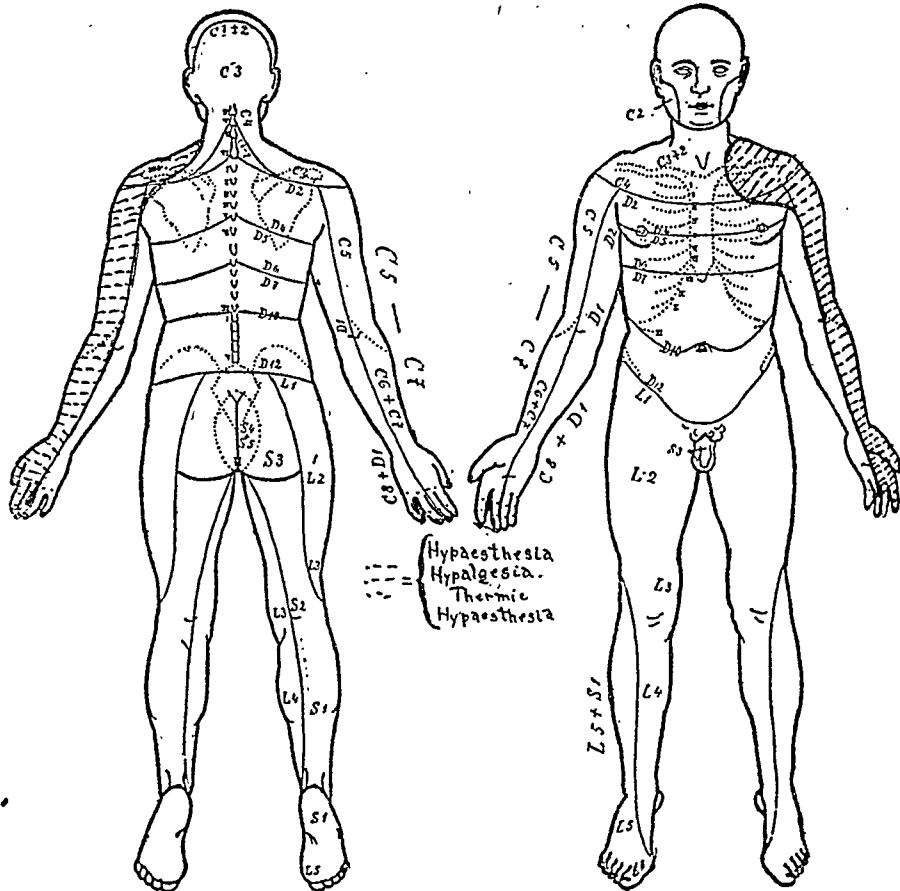
DR. SYMS presented also a boy, twenty years old, who was admitted to the Lebanon Hospital on January 1, 1913, with the history that on that day he was thrown from a moving train, striking on his head and right shoulder. Examination showed an avulsion of the scalp from the frontal region backward. There was no evidence of fracture of the skull, but the patient was irrational and violently maniacal for several days, requiring restraint. There was also a fracture of the shoulder-joint, and it was with great difficulty that his arm could be sufficiently immobilized to prevent the fragments of bone from penetrating the soft parts. After a number of days had elapsed, and a satisfactory examination became possible, it was found that he had a fracture of the upper end of the humerus, with dislocation of the head from the glenoid cavity. This diagnosis was confirmed by X-ray.

Attempts at reduction were futile, and the patient was not fit for operation until three weeks after his injury. On January 22, 1913, the joint was exposed anteriorly, going through the split fibres of the deltoid. The head of the bone was found dislocated, with its fractured surface pointing backward and outward. The head was removed with considerable difficulty, and the upper end of the shaft placed in the capsule of the joint. The capsule was then sutured and the superficial wound closed. The patient made a good recovery and left the hospital on February 23, 1913. He now had very fair function of the arm.

There was very slight sensory improvement. There was no sign of improvement in the shoulder region.

*Operation* (February 20, 1911).—Ether anaesthesia. The oblique incision previously described was used. The fat and cervical fascia at the base of the neck were very much infiltrated,

FIG. 8.



indurated, and adherent to the front of the plexus roots. This mass of tissue was separated from the plexus and retracted inward. The nerves themselves showed no macroscopic lesions, and were therefore suffering chiefly from the overstretching and from the pressure and adherence of the indurated mass lying in front of them.

During the dissection and manipulation much of the infiltrating material escaped from the fatty fibrous tissues so that

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## ORIGINAL MEMOIRS.

"RAUMATIC ERB'S PARALYSIS IN THE ADULT.\*

BY ALFRED S. TAYLOR, M.D.,

AND

LOUIS CASAMAJOR, M.D.,

OF NEW YORK CITY.

THE occurrence of traumatic Erb's paralysis in adults is so frequent and the menace to the future utility of the extremity is so great as to justify a discussion of the subject before his Society.

In all essential features these adult cases are exact counterparts of the brachial birth palsies of Erb's type.

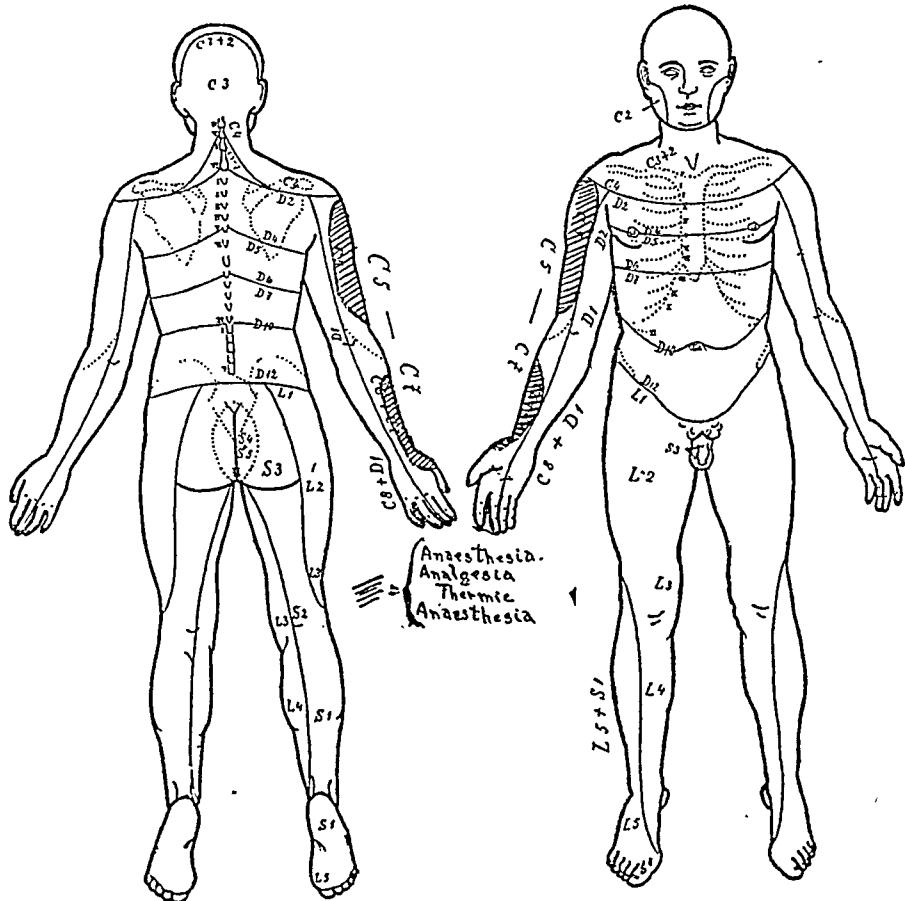
These paralyses are practically always caused by the forcible separation of the shoulder from the head and neck. The more suddenly the force is applied, the more likely are the roots to be torn across instead of simply stretched and frayed. There are many ways in which this separation occurs, but a few illustrations will suffice. One patient fell from the top of a freight car, striking simultaneously upon his head and shoulder with resulting sudden forcible separation of the two. Another, when his bale hook slipped, did a half somersault backward, landing on his head and shoulder. Another was caught in a door which was closing by hydraulic pressure. Another was hit on the shoulder by the long starting lever when a big marine gas engine kicked back. A hundred pound

\* Read before the New York Surgical Society, April 23, 1913.

on August 27, 1912 (14 weeks after his accident). His condition was unchanged except that atrophy of the deltoid and shoulder girdle muscles of the right side had occurred.

*Operation* (August 29, 1912).—Ether anaesthesia. The oblique incision was made on the right side of the neck. The lesion was found to involve the fifth and sixth roots and their junction. The suprascapular nerve was cicatrized for about a

FIG. 9.



centimetre from its origin. The cicatricial process in the roots extended to just within the intervertebral foramina. The line of section passed through the roots just external to the foramina, through the distal trunks at their origin from the junction of the two roots, and through the suprascapular just beyond the damaged portion.

innervation comes from the lower roots of the plexus. There is lost the power of abduction and external rotation at the shoulder, flexion at the elbow, and supination of the forearm, so that the unopposed action of the antagonists causes inward rotation of the arm and pronation of the forearm which gives the characteristic attitude to these paralyzed extremities.

When the injury involves the lower roots there is lost the power to move the wrist, the fingers, and the intrinsic muscles of the hand.

If, as occasionally happens, the damage to the roots occurs close to or within the intervertebral foramina, the nerves running to the serratus magnus, the rhomboids, etc., are injured and wing scapula results.

Occasionally the roots are torn from the cord itself. The resulting superficial scar formation on the surface of the cord may later cause changes in the reflexes or the appearance of the Babinski phenomenon in the corresponding lower extremity.

The muscles which are totally paralyzed become flaccid, show the complete reaction of degeneration (R. D.) (five to seven days), and soon begin to atrophy. Because of such changes in its surrounding muscles the shoulder-joint usually becomes a typical flail-joint.

Other muscles show varying degrees of sluggishness in their reaction to electrical stimuli.

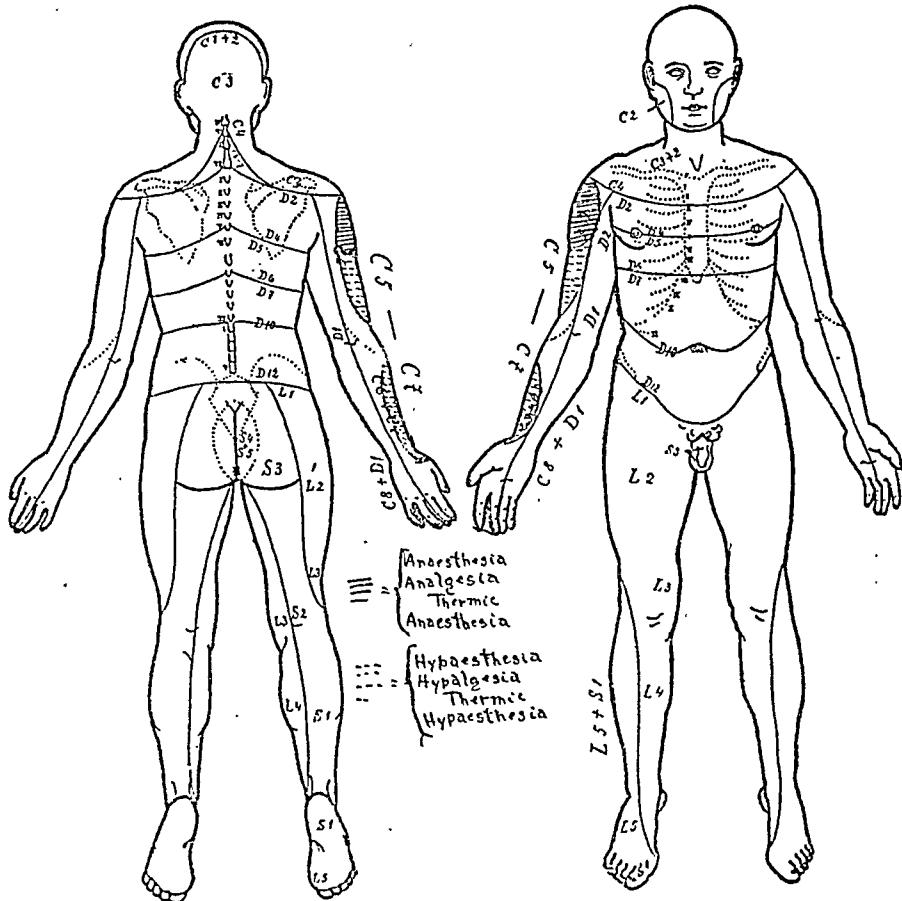
The muscle reflexes are diminished or lost, and there is a decided loss of muscle tone.

Sensory disturbances are less definite and less extensive than the paralyses. The area of sensory disturbances depends somewhat on the extent to which neighboring sound sensory nerves overlap on the field of distribution of the damaged ones. Usually the upper outer region of the arm (the deltoid region) shows the most definite changes. A central area of complete anaesthesia is apt to be surrounded by a border of diminished sensibility which shades off to normal at the periphery.

The areas of disturbance are not co-extensive for the different forms of sensory stimuli (see Figs. 9, 10, 11, and 12).

On September 24 there was a loss of all forms of sensibility over the areas supplied by the seventh and eighth cervical and first dorsal nerves. There was weakness of the triceps, extensors of the wrist and fingers, pronators, pectoralis major, and latissimus dorsi; paralysis of all the flexors of the wrist and fingers, of the thenar and hypothenar eminences, and of the interossei.

FIG. 10.



The sensory symptoms referable to the middle trunk gradually cleared up.

On September 30, a radiograph showed a fracture of the left transverse process of the seventh cervical vertebra with the fragment lying over the region of the eighth cervical and first dorsal roots. At this time he was complaining of severe cramps in the flexors of the forearm.

found which would inevitably have caused permanent paralysis of crippling extent. Nothing short of surgical intervention could have overcome the obstruction to the passage of nerve impulses.

With proper surgical interference the prognosis is immensely improved, but even so, a perfectly functioning extremity can be expected in only a very small percentage of cases.

Certain factors influence the prognosis in any given case:

In general, the longer the time elapsed between the injury and its surgical repair the less perfect will be the regeneration. Nevertheless many cases are on record in which, after years have elapsed, repair has been followed by very satisfactory improvement.

The more extensive the lesion, the less favorable the prognosis, but the more imperative is it to interfere and repair the damage as far as possible.

When the cicatrix extends into the intervertebral foramina the outlook for regeneration is bad and it may be necessary to anastomose the distal trunks into other roots.

When the roots are torn from the cord, anastomosis is the only resource which gives any hope.

Accurate approximation at the time of suture, prolonged immobilization with the shoulder and neck in close proximity, and systematic persistent after-treatment very greatly favor the final success in these cases.

The treatment in all these cases should be surgical. The interference should be at the earliest feasible moment. If the tissues at the base of the neck are much contused, a delay for a few days, in order to increase the local resistance, is desirable. Where the paralysis is very slight conservatism might counsel delay in the hope of obtaining spontaneous recovery, but in all cases where the paralysis is at all marked, the time used waiting for spontaneous recovery is wasted.

In paralysis of slight degree, if operation uncovers no macroscopic lesion of the nerve-roots, the wound is closed and no damage has been done to the patient, for this operation

On January 19, 1913, Dr. Beling made the following notes:

Circumference.	Right.	Left.
Mid-arm .....	9 $\frac{3}{4}$ inches	8 $\frac{1}{4}$ inches
Below elbow .....	9 $\frac{5}{8}$ inches	8 $\frac{1}{2}$ inches
Wrist .....	6 $\frac{1}{4}$ inches	5 $\frac{7}{8}$ inches

The triceps was weak with partial R. D. Biceps in good condition. Deltoid in fairly good condition. The lower portion of the pectoralis major was atrophied, the upper portion in good condition. Pectoralis minor rather weak.

The muscles supplied by the eighth cervical and first dorsal were markedly atrophied, completely paralyzed, and showed complete R. D. Left wrist-jerk was absent.

There was no Babinski phenomenon and no ankle clonus on either side.

The knee-jerks were about equal and normal.

*Operation* (January 20, 1913).—Ether anæsthesia. The two lowest roots of the left plexus were exposed by the transverse incision. They showed no cicatrices within their sheaths and were not adherent to the surrounding structures. They were easily isolated. They seemed somewhat softer than normal roots. On cross section at their exit from the foramina they showed considerable yellowish, fatty substance within their sheaths and the nerve bundles were not nearly so definitely arranged and visible as in normal roots.

The two roots together were implanted into a longitudinal slit in the side of the junction of the fifth and sixth roots, with fine chromic gut sutures. The seventh root was none too good at innervating its own group of muscles, so was not considered for the grafting process.

The wound was closed without drainage and the extremity put up in a sling, which was worn for three weeks.

Sufficient time has not elapsed for results to have appeared.

**CASE VI.**—Jeanne G., forty years old, was admitted to the Third Division of the Neurological Institute on January 21, 1913, with paralysis of the right upper extremity. About five weeks before, she had fallen backward out of a window about five feet to the ground, striking first on the left hand and sustaining a Colles fracture, then rotating so that her right shoulder and head struck. The right upper extremity was paralyzed.

ing nerve bundles in the divided nerve ends. It is sometimes necessary to make several sections before getting a satisfactory looking end. In the distal nerve trunk one can always get a satisfactory looking end by going far enough. In the proximal end, however, the cicatrix sometimes extends up into the intervertebral foramen. These exceptional cases will be considered later.

When the nerves have been properly prepared, end-to-end suture should follow. The best suture material in adults is fine strong silk because it is dependable. On opposite sides of the nerve, about one-half centimetre from its freshened end are passed two sutures transversely to the long axis of the nerve, and including mostly nerve sheath. Each suture is tied so as to get a firm hold and the ends are left long. The other freshened nerve end is treated in similar fashion and the two are approximated by tying the lateral sutures of the one to the other. One or two fine catgut sutures at the periphery will complete the apposition.

Another method of suture which is satisfactory, especially where there is not too much tension, consists in passing a loop of chromic catgut through both nerve ends and tying them together. This is quicker and simpler but has the disadvantage of perforating the nerves as well as not being quite so dependable.

While the nerve sutures are being tied the neck and shoulder are approximated. The fat pad is allowed to fall into place, and the skin wound is sutured with silk. No drainage is used.

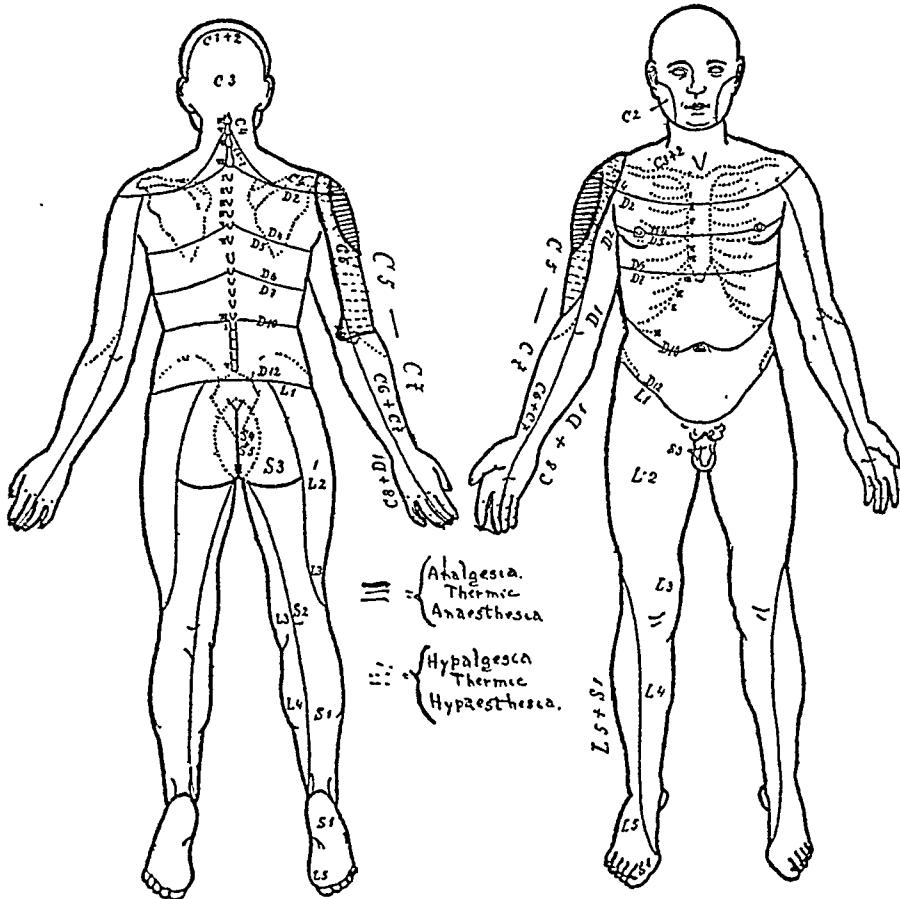
The approximation of the neck and shoulder is maintained by means of a steel brace especially designed for these cases and fitted previous to operation so that it can be slipped on just after the nerve sutures have been tied and thus prevent any chance of tearing them out.

This brace is worn continuously, without a moment's intermission, for six to twelve weeks according to the individual case.

In those cases where the cicatrix extends up into the inter-

*Operation* (January 21, 1913).—Ether anaesthesia. The transverse incision previously described was used in this case. The fat pad was divided in the same line, exposing the damaged deep cervical fascia adherent to the plexus. When this was dissected away it was found that the fifth root had been completely ruptured just above its junction with the sixth, the sixth root had

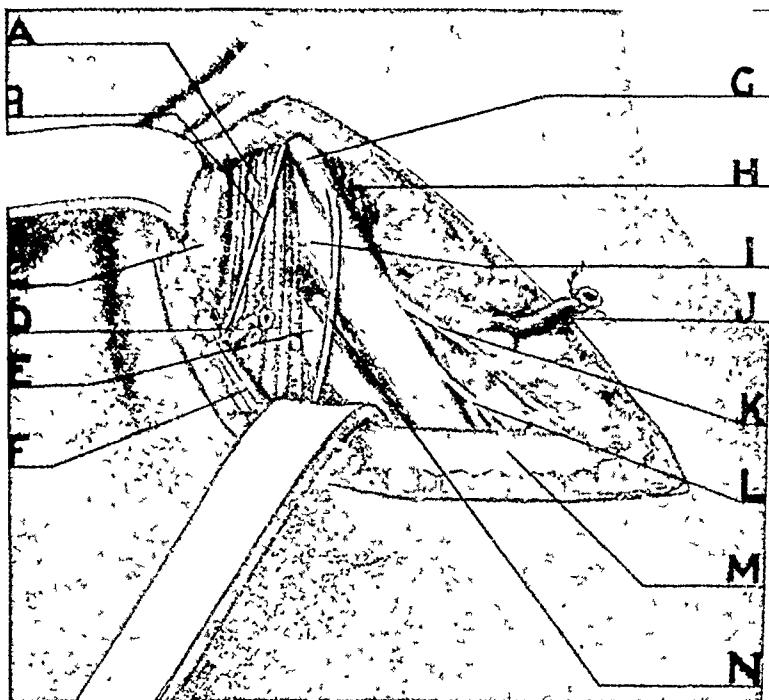
FIG. 12.



been almost torn across but was still connected by a cicatricial band about 2 cm. long with the junction of the fifth and sixth roots, which had been displaced toward the clavicle about that distance. The seventh and eighth roots appeared undamaged.

The line of section went through the fifth and sixth roots about 0.5 cm. external to the foramina, through the junction of the two near its distal end, and through the suprascapular near

FIG. I.



Operation for relief of brachial paralysis. A, scalenus anticus muscle; B, phrenic nerve; C, internal jugular vein; D, transversalis colli artery; E, seventh root; F, omohyoid muscle; G, fifth root; H, scalenus medius muscle; I, sixth root; J, transversalis colli artery; K, suprascapular nerve; L, external anterior thoracic nerve; M, clavicle; N, nerve to subclavius muscle.

decided signs of nerve regeneration and returning muscular power.

In the fifth case, where the two lowest roots were probably torn from the cord, the transplantation has been done too recently to afford any evidence of nerve regeneration.

The sixth of the series ought to give a very good result. The patient was operated upon five weeks after the accident, the nerves above and below the cicatrix were good, and the approximation by suture was nearly perfect. We shall hope to show this case when sufficient time has elapsed for recovery to have occurred.

These plexus injuries are by no means rare, and yet there is no well-settled system of management of them which is generally recognized by the surgical side of the profession. This fact is illustrated by the following two instances which have come within our knowledge: A young man fell from a freight car, landed on his head and left shoulder, and suffered complete paralysis of the left upper extremity. Six weeks later he was sent into one of the large general hospitals of this city. Exploration showed complete rupture of the plexus with wide-spread formation of scar tissue. The wound was closed with no attempt at repair, the man was told never to let any one attempt to do anything with the plexus, by another operation, and he was turned loose with the flail extremity unsupported and dragging on the plexus and muscles so that any chance of partial spontaneous regeneration was lost. In this case resection of the cicatrized plexus together with resection of the middle part of the clavicle would have allowed sufficient approximation of the nerve ends to have given some chance of regeneration and later usefulness.

In the other case a man had his left plexus completely ruptured by the kick back of the starting lever of a big marine engine. He was taken to a well-known hospital, not in New York City. The day after injury the plexus was explored but no attempt at repair was made. On the fourth day, for some unexplained reason, the extremity was amputated at the shoulder.

FIG. 3.

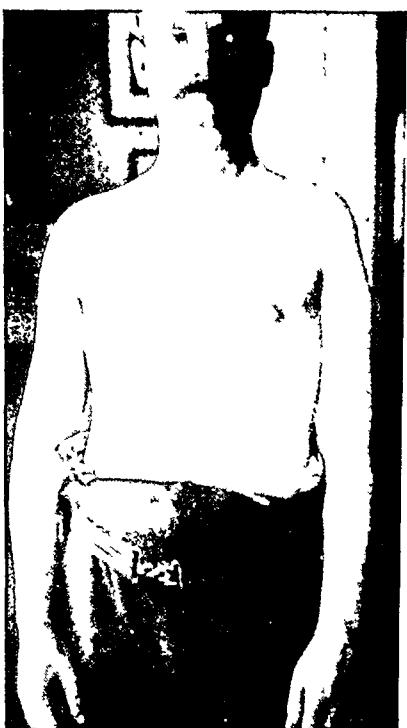


FIG. 4.



FIG. 5.



Figs. 3, 4 and 5.—Before operation. Showing flail-joint at shoulder, with marked atrophy of the muscles.

the individual case. If no macroscopic injury is found, practically nothing but a skin wound has been made. After the few days required for healing, the after treatment may be started vigorously and with exact knowledge of the condition to be dealt with. If gross injury is found it can be repaired at once and so cause the least loss of time to the patient, and give the most favorable opportunity to the nerves for complete repair.

Operation consists in the resection of the damaged areas of nerve, followed by end-to-end suture of the roots and trunks.

In bad cases where the resection has been so extensive that approximation by suture is impossible, resection of the middle of the clavicle will greatly facilitate the approximation. An extremity that will move, even with the clavicle absent or distorted, is very much to be preferred to one that is paralyzed but with the clavicle intact.

After-treatment consists in the wearing of some fixation apparatus for from six to twelve weeks, which shall keep the neck and shoulder of the damaged side in close approximation to favor firm anatomical and physiological union of the nerves. With the removal of the fixation apparatus the various forms of physical therapeutics should be systematically employed.

Results are late in appearing and will seldom be perfect.

they regain their tone the sling may be discarded. With the return of voluntary motion the patient should be encouraged to take systematic exercises for the development of the muscles.

CASE I.—Patrick B., thirty-five years old (with Dr. T. P. Prout). Six and one-half months before operation, while working, his bale hook slipped and he did a half somersault backward, landing on his head and left shoulder. There was immediate complete paralysis of the left upper extremity, except for some motion in the fingers and wrist.

During the period before operation there had been full return of motion and power in the hand and wrist. He had not been able to use the shoulder muscles nor to flex the elbow.

*Physical Examination.*—There was some voluntary motion in the pectoralis major. The deltoid and spinati muscles were markedly atrophied, and the shoulder was a flail-joint. The biceps and brachialis anticus were moderately atrophied. They could not flex the elbow, which was held firmly extended by an active triceps. There was no supination of the forearm. Mobility and power of the wrist and fingers was apparently normal (Figs. 3, 4, and 5).

The junction of the fifth and sixth roots on the left side of the neck could be felt as a palpably thickened tender mass.

*Operation* (June 28, 1905).—Ether anaesthesia. The oblique incision from the posterior border of the sternomastoid muscle at the level of the carotid tubercle down to the junction of the middle and outer third of the clavicle was used. The skin, underlying fat pad, and vessels were divided. The deep cervical fascia was found thickened and adherent to the junction of the fifth and sixth roots, which junction was much enlarged and full of hard cicatricial tissue. The deep fascia was dissected off. The lines of section for the removal of the cicatrized nerve passed through the fifth and sixth roots just before their entrance into the junction, through the suprascapular nerve just after its origin from the junction, and through the distal nerve trunks just after their exit from the junction. The segment removed was about 2 cm. long. End-to-end suture was then done with No. 1 silk as previously described.

Good approximation was gotten without much tension.

The name, Banti's disease, has been applied incorrectly to all three stages but it is the symptom-complex of the ascitic stage alone that should bear the name of the man who did so much to clear up its symptomatology and pathology.

During the first stage, there are usually marked fluctuations in the severity of the symptoms. Months may pass in which slight enlargement of the spleen is the only demonstrable lesion. Again during the exacerbations, the spleen may enlarge enormously, with coincident increase in the anaemia and icterus.

*Etiology.*—The etiology of splenic anaemia has proved baffling. Much confusion has arisen and the main purpose befogged in endless discussion as to whether or not the splenomegaly is primary or secondary. The mere fact that we have first this splenomegaly is important, but not necessarily convincing that it alone is responsible for the anaemia, the cirrhosis and endophlebitis of the splenic and portal veins.<sup>1</sup> Rather would it seem more reasonable to us that the splenomegaly was a link in the chain which resulted from the chronic irritation of some as yet unknown toxin, probably of gastrointestinal origin. Having once acquired splenomegaly, we believe that it is responsible for the anaemia by reason of an exaggeration of its normal haemolytic functions. In other words, the spleen finds itself much in the same position as the thyroid, which, as the result of some irritation, increases its activity and thus brings about hyperthyroidism. It is logical to assume this because we know that splenectomy, if done in the first stage, stops the anaemia with an early return of the blood picture to normal. Here again, comparison with the results of partial thyroidectomy are apt, since there too an excessive physiological function is checked. But we do not have to depend on splenectomy alone to feel sure this is so. Banti in his latest paper states that the anaemia is due to increased haemolysis chiefly, and secondly to an actual increase in the blood destroying units of the spleen.

Banti, Joannovico, Lemarre and Gaucher have shown that splenectomized dogs have an increased resistance to certain

origin, and through the nerve trunks just beyond the cicatricial mass.

End-to-end suture was done by means of chromic catgut. Dressings were applied as in Case I.

(This case was done on short notice in a hospital far out of town, and the complete history both before and after operation which were promised have never made their appearance. The typical history of injury and the characteristic findings at operation make it a case in point.)

CASE III.—Fritz S., thirty-three years old, mechanic, entered the Neurological Institute, Third Division, on February 10, 1911, with paralysis of the left upper extremity.

He had always been well and doing heavy work.

On January 23, 1911, he was caught by the door of an air chamber in a caisson and jammed in such fashion that his left shoulder was crowded downward while his head was pushed well over on his right shoulder, in other words, his head and left shoulder were slowly, forcibly, and very widely separated. He was confined in this position for forty-five minutes, when he was released in an unconscious condition. On the recovery of consciousness he was found to have dislocation of the right shoulder and complete paralysis of the left upper extremity.

Eleven days later there was slight flexion and extension of the fingers of the left hand. Otherwise there was complete paralysis, but with no restriction of passive motion. There were no definite anæsthesias, but all sensations were somewhat dulled over the area supplied by the fourth to the seventh cervical roots (Fig. 8).

There was moderate atrophy of the left deltoid and scapular muscles. The vasomotor condition was normal, the nutrition was good. R. D. was complete in the deltoid, and partial in the biceps.

Dynamometer test showed L. o, R. 60.

X-ray plates showed no lesion of the cervical spine.

There was no Babinski phenomenon on either side.

February 19, 27 days after injury, there was slight flexion and extension at the elbow and wrist, slight supination and pronation of the forearm, and full range of flexion and extension of the fingers. None of these movements had any power. Dynamometer R. 80, L. 5.

the red blood corpuscles and haemoglobin is coincident with augmentation of icterus and urobilinuria.

The question of the primary intoxication is by no means so definitely settled. Senator was perhaps the first to suggest that the toxin was absorbed from the gastro-intestinal tract. Others have followed accepting this theory, some offering clinical data to substantiate their position. Ostrowski, who states that in ten cases of splenic anaemia in children all had had an antecedent diarrhoea, and Ungar and Neuberg believe that the gastro-intestinal tract must be looked into. It would seem not illogical to assume that the gastro-intestinal tract might furnish the toxin because of the somewhat similar clinical picture that is found in protracted auto-intoxication and in the beginning of splenic anaemia. Banti, however, adhering to the infectious theory, does not believe that the irritant comes from the gastro-intestinal tract, reasoning that the atrophy occurring in the liver from cirrhosis due to auto-intoxication is not produced for years, whereas that occurring in the liver during the third stage of splenic anaemia occurs in a few months. Conflicting ideas also are advanced as to casual relation existing between splenic anaemia and certain diseases, as tuberculosis, syphilis, Kala-Azar, malaria and gout. Banti again thinks that his syndrome, when occurring as the third stage of splenic anaemia at least, is a disease *sui generis*, but does not deny that enlarged spleen, cirrhosis and ascites may be found in the terminal stages of other diseases, as is pointed out by Hultgen, Rolleston and others. Osler thinks that when secondary anaemia and splenomegaly are found in other conditions the differential diagnosis may be made, since (a) the cause is usually apparent as malaria, tuberculosis, syphilis, etc., (b) the anaemia and splenomegaly usually yield to appropriate treatment, (c) the spleen is not so large, (d) sequences not so characteristic, (e) the blood, while showing secondary anaemia, does not usually show the exaggerated chlorotic type, and (f) leucocytosis is more common than leucopenia.

We know that the spleen is not rigidly controlled by

the mass was much smaller and softer when the wound was closed. No drainage was used.

February 23: Voluntary motions were much more rapid than before operation.

February 25: Healing by primary union. Sutures removed.

February 28: A sling was substituted for the steel brace which had developed one or two uncomfortable pressure points. From this time on massage and interrupted galvanism were used. Special massage was given to remove the induration from the tissues in front of the plexus.

The sensory disturbances gradually disappeared. On March 11, 1911, he was referred to the dispensary for continued treatment.

March 23, 1911: All the muscles except the deltoid are stronger. He is able to raise his hand to his face.

Dynamometer L. 80, R. 115.

The sensory disturbances are gone.

The patient disappeared and was not seen again until December, 1912, when the left arm seemed perfectly normal. The deltoid was completely restored and was so strong that he could support the weight of a man on the outstretched left arm.

There were no signs of atrophy or weakness anywhere in the extremity.

CASE IV.—Jas. H., thirty-nine years old, ironworker, came to the Clinic of the Neurological Institute, Third Division, on July 2, 1912, complaining of paralysis and numbness of the right upper extremity. Six weeks before, a hundred pound chain, after falling 75 feet, struck him on the right shoulder. The upper third of the humerus was fractured and a cast was applied. On the removal of the cast four weeks later, there was complete paralysis of the extremity, also numbness of the outer side of the arm. There was no pain.

Examination showed complete flaccid paralysis of the right upper extremity with a flail-joint at the shoulder.

Passive motion was perfectly free. The reflexes were lost. R. D. complete in the right deltoid and biceps. There was some anaesthesia of the arm and forearm (Fig. 9). There were no abnormal signs elsewhere.

Systematic treatment with interrupted galvanism having caused no improvement, he entered the hospital, Third Division,

breaking the intima by compression and partially occluding the lumen by means of a silver wire passed around the vein, so as to constrict, but not totally obstruct it. In no case were we able to produce by this means portal thrombosis, although slight temporary enlargements of the spleen were again noticed to measurements.

The pathological studies of the removed spleen following ligation showed passive congestion in the early cases, that is, those removed not later than one month after operation, but no real hyperplasia of the splenic substance. In the later cases, those removed after one month or longer had elapsed, there was atrophy of the splenic pulp and an increase in connective tissue. The blood pictures during the period of splenic enlargement showed no characteristic change beyond a leucocytosis following operation, which returned to the normal after an average period of two weeks had elapsed.

Other experimental work has been done; thus Solowieff produced a fibroid condition of the liver by producing occlusion of the portal branches in dogs. Osler cites a case of his own, however, in which there was obliteration of the portal but no true cirrhosis, although the liver was atrophied and had undergone fatty degeneration to some extent. This case showed enormous enlargement of the spleen with the thrombosis of some of the splenic veins and with that of Cruveilhier, shows that obliteration of the portal can take place in man without cirrhosis of the liver. Banti reports the results of an extensive bacteriological study. Believing that the disease is bacterial in origin, he cultured the peripheral blood, splenic substance, blood of splenic vein and bone marrow in fatal cases without result. Aërobic and anaërobic cultures were both negative. In addition, guinea pigs, rabbits, dogs and rats were injected with the blood, splenic juice, liver and bone marrow without result. Fragments of spleen, liver and bone marrow have been directly injected under skin and into the peritoneal cavity still without infection. Finally Banti grafted pieces of the diseased spleen into the normal spleen of dogs, also without result. He states that similar bacteriological studies by others have always yielded negative findings. Although these experiments have been thoroughly carried out the parasitic origin of the disease has by no means been disproved. The cellular hyperplasia of the spleen in this condition is suggestive of an irritation due to bacterial or at least protozoal growth. Again, in the diseases most closely simulating splenic anæmia, such as tuberculosis and syphilis of the spleen, malaria, etc, specific organisms have been isolated.

*Pathology.*—Many observers have carefully studied the pathology of splenic anæmia. In the main they agree as to the macroscopic and microscopic picture of the disease. In brief, the essential pathology is first an anæmia of the chlorotic type, the microscope showing marked aniso- and pœcilocytosis, polychromatophilia and often basophilic de-

The two roots were split longitudinally up into the foramina until good nerve bundles were seen. Chromic catgut sutures were passed between the split roots and the distal trunks, including the suprascapular.

When these sutures were tied, the best approximation obtainable still left a gap of 1 cm. between the nerve ends. Cargile membrane was wrapped around the sutures to form a sort of canal. The wound was closed without drainage. The steel brace was applied and was worn steadily for twelve weeks. Good primary union was obtained.

When the brace was removed on November 22, the extremity was very stiff and atrophy, especially around the shoulder, was marked. Sensory symptoms and electrical reactions were the same as before operation.

Active massage and interrupted galvanism were used systematically. In February, 1913, power in the hand was fast returning, there was fairly good flexion at the elbow, but nothing in the deltoid.

April 1, 1913 (seven months after operation), the arm was held close to the body, with the forearm pronated. The elbow could be flexed to a right angle. Supination was not possible.

Abduction at the shoulder to 15 degrees, forward extension to forty-five degrees, and backward extension to normal degree were found.

Dynamometer R. 35 kg., L. 55 kg.

Sensation was improved (see Fig. 10).

CASE V (with Dr. Beling).—Roy S. P., age twenty years, had always been in good health up to the time of his injury.

On September 11, 1910, while going 60 miles an hour in a motor-cycle race, he was thrown, landing with his head toward the oncoming machines. As he was scrambling to his feet one of them hit him in the left base of his neck. He was unconscious, the pulse was 150, the left pupil was dilated and did not react to light, while the right pupil was contracted. There was no bleeding from the nose or ears. The sixth and seventh left ribs were broken in the midaxillary line.

For three days there was retention of urine, and for two weeks a low muttering delirium persisted.

Four days after the accident it was noticed that he did not use his left arm.

A man, forty-six years of age, suffering from mild anæmia of two years' duration, with its usual symptoms and with a spleen reaching to the level of the umbilicus, was examined early in the year. His past history was negative with the exception of occasional attacks of gastro-enteritis and chronic nasal catarrh. An examination showed chronic frontal sinus trouble and marked gingivitis with symptoms of gastric and intestinal stasis. After several months of treatment for these conditions there has been a decided improvement as to the blood and spleen, and marked betterment of the patient's subjective symptoms. The case has been under observation for too short a time to definitely decide whether the improvement is to be more than temporary.

The intravenous injection of salvarsan has been used for this condition and its results parallel those of internal medication, *i.e.*, improvement in symptoms without permanent recovery.

Treatment by X-ray has been tried at various times. Lucatello reports a marked improvement in general condition in the blood and in the spleen for a time, but the relief from this, as from medicine, is only temporary.

In taking up the surgical treatment it may be wise to review the topography of the spleen. We are dealing with an organ of the upper abdomen, lying well within the vault of the diaphragm and overlaid anteriorly by the fundus of the stomach and posteriorly by the ribs. It is securely held in place by its ligaments and in the disease under discussion is often additionally fastened to the surrounding organs and parietes by firm adhesions. Its blood-vessels are large and extremely thin-walled, making ligation a serious matter. The splenic pulp is brittle and tears and bleeds easily under rough handling.

With these points in mind, the difficulties of operative procedures can readily be estimated. Proper exposure is the first essential. Mayo, Meyer, Treves and others have suggested various methods of approach, all of which have many points of merit. We would like to call special attention to a modification of the incision described by Dr. Edward Martin for exposure of the liver and which, in the dissecting room

### TRAUMATIC ERB'S PARALYSIS.

On October 2, 1910, the left knee-jerk was a little more lively than the right. There was no Babinski and no ankle clonus on either side.

The persistent symptoms were characteristic of the lower arm type of brachial paralysis (Klumpke type). There were associated symptoms of paralysis of the sympathetic, evidenced by homolateral pseudoptosis, myosis, enophthalmus, and an absence of the ciliospinal reflex.

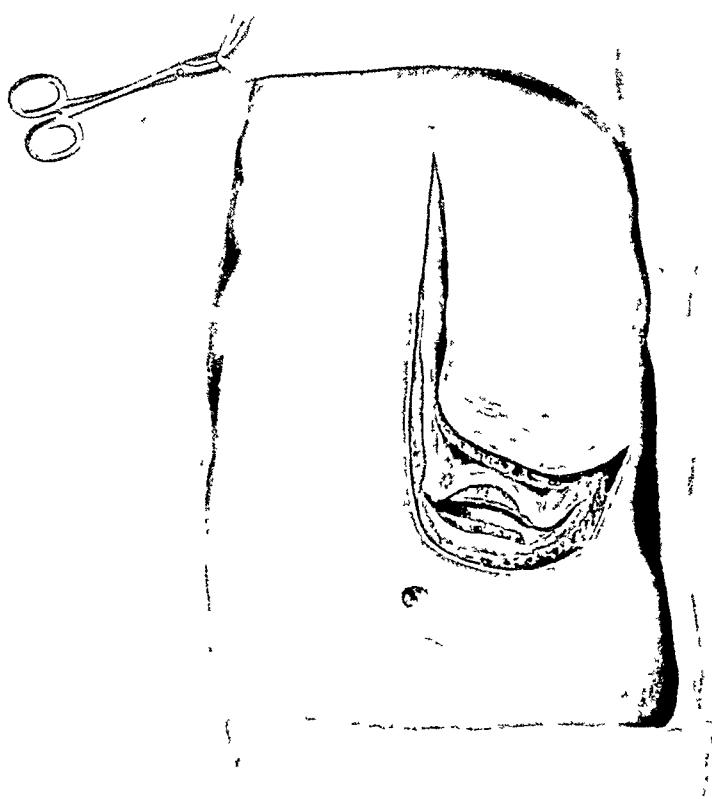
The cramps were very troublesome. They were believed to result largely from irritation caused by the movable fragment of transverse process previously mentioned, inasmuch as they were greatly aggravated by such movements as caused muscular pull on the fragment. It therefore seemed advisable to explore the plexus and to remove the fragment.

*Operation* (November 1, 1910).—Ether anaesthesia. The oblique incision was used for the exposure of the plexus. The loose fragment of bone was found to consist of the anterior half of the left transverse process of the seventh cervical vertebra, and was displaced downward, pressing somewhat upon the eighth nerve-root. This fragment was removed. Examination of the roots of the plexus showed no macroscopic evidence of damage, so the wound was closed and the extremity placed in a brace to prevent the drag of the paralyzed extremity on the nerve-roots. After three weeks the brace was replaced by a sling and the extremity was given massage and electricity at the irregular times that he appeared for treatment.

There was a gradual return of power in the muscle groups supplied by the fifth, sixth, and seventh roots. The cramps were diminished in frequency and severity but did not entirely disappear.

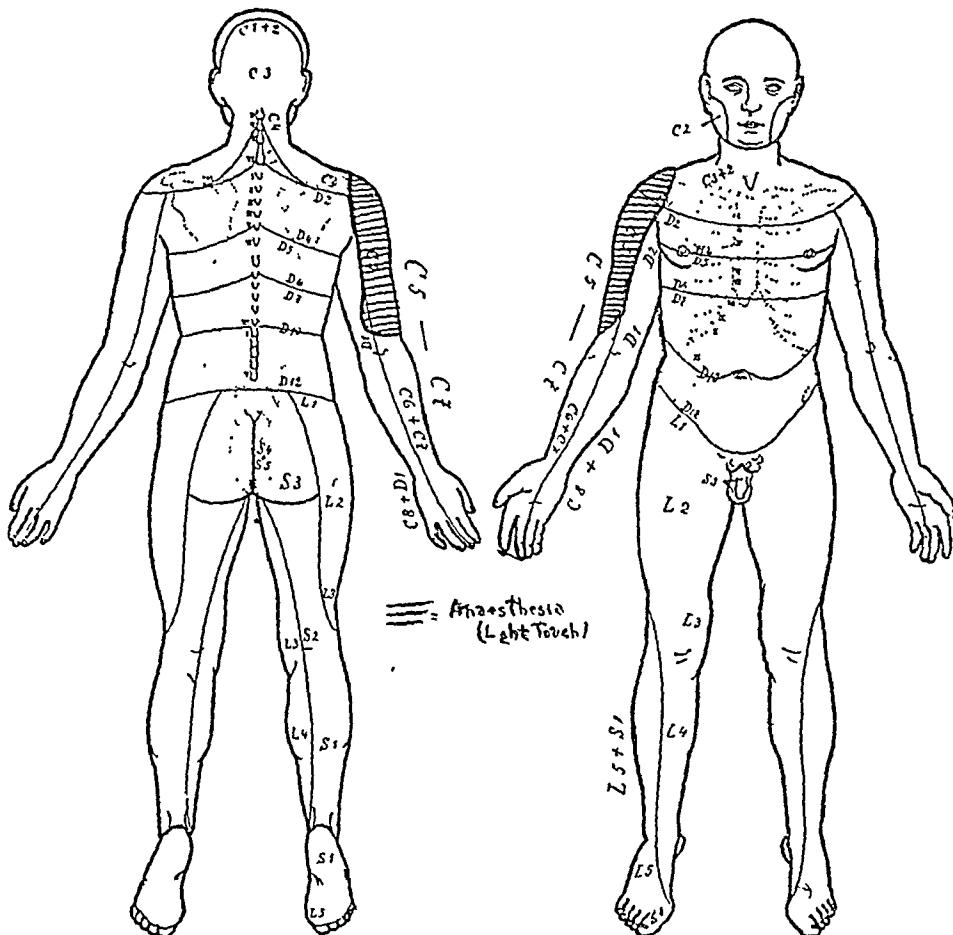
After 28 months there had been no improvement in the muscles supplied by the eighth cervical and first dorsal; on the contrary they had undergone marked atrophy. Remembering that these roots, at the time of the operation, had shown no macroscopic evidences of injury, it seemed, from the persistent paralysis, that they must have been torn from the cord at the time of the original accident, and that the only thing left to do was to transplant them to some of the other roots.

FIG. 2.



*Physical Examination.*—It was seen on admission that motions of the wrist and hand were fairly well preserved, but that elsewhere in the extremity there was complete flaccid paralysis. Passive motion was unobstructed. The reflexes were abolished in the right upper extremity, but were normal everywhere else in the body.

FIG. 11.



There were no apparent muscle atrophies, but the muscle tone in the deltoid, biceps, and triceps muscles was much diminished.

R. D. was present in the deltoid and much diminished excitability in the biceps and pectoralis major.

There was anaesthesia to light touch over the area of the right fifth cervical root. To pain and thermal stimuli the area of anaesthesia was smaller but was surrounded by an area of hypalgesia coincident with the distribution of the fifth root (Figs. 11 and 12).



## TRAUMATIC ERB'S PARALYSIS.

its origin. Silk sutures were used and complete approximation of the nerve ends obtained: The wound was closed without drainage and the brace applied. Primary union was obtained. The brace is still on.

## COMMENT.

The series of cases reported in this paper has given results that are so far by no means brilliant. The last half of the series is still in process and no one can tell what the final results will be.

In five out of the six, lesions were found that precluded anything like satisfactory spontaneous recovery.

In the first case, in spite of his removing the restraining dressings and probably rupturing the nerve sutures, the patient regained some power in muscles innervated by the roots from which the cicatrix had been excised, showing that some regeneration had occurred even under most adverse circumstances.

In Case II no post-operative information has ever been obtainable, but a lesion was exposed and removed which would have caused permanent paralysis in the muscles supplied by the fifth, sixth, and part of the seventh roots.

In the third case, while there was no macroscopic lesion of the roots, there was distinct interference with nerve function caused by the densely infiltrated tissues of the base of the neck, which were firmly adherent to the front of the roots. The operation not only loosened up this adherent material, but gave precise information upon which to base the treatment which led to steady improvement and final complete recovery.

In the fourth case there seemed, at the time of operation, very little hope for a good result. The cicatricial tissue extended up into the foramina in both the fifth and sixth roots so that they had to be split longitudinally to expose good fibres; the cicatrix was extensive and required free excision; the suture could not bring the distal trunks nearer than 1 cm. to the damaged root stumps. In spite of these handicaps, at the end of seven months from operation, the patient is showing

In splenic anæmia, splenectomy during the first and second stages gives far better results than any other form of treatment. The production of toxins which affect the blood, liver and other organs is stopped and nature is given a chance to repair the damage already done to the rest of the system. The anæmia rapidly decreases. The resistance of the red blood cells is increased to above normal. The icterus and gastro-intestinal symptoms disappear and weight and strength are regained. The effects of the removal of the spleen in this condition resemble closely those following thyroidectomy for exophthalmic goitre. In both, the secondary and presumably the major, but not the primary source of intoxication, is removed, and the resultant marked improvement in the patient's health, while perhaps not so rapid, is as sure and as permanent from splenectomy as from thyroidectomy.

In cases reported up to the year 1908 splenectomy in the first or second stage gives a mortality of 17 per cent. This figure is based on the reports of Siimmonds and Torrance, who collected in all thirty-five cases, with only six deaths. From 1908 to 1912 the results have been even more favorable. Forty-seven cases have been reported by various authors in which splenectomy has been performed before the appearance of Banti's symptom-complex. Of these cases only 5 or 10  $\frac{1}{8}$  per cent. have died. It is impossible to state with absolute confidence that splenectomy gives a permanent cure, but at least it can be said that the majority of these cases have been followed for 1 to 9 years after operation and a few have been under observation for 12 years and in no case has there been a return of the previous symptoms.

A case reported by Banti may be cited as typical of the great improvement brought about by early splenectomy. The patient, fifty years of age, with a history of typical symptoms lasting over a period of fourteen years, was operated upon in February, 1903. In October, 1902, the blood count showed Hb. 60 per cent.; R.B.C. 3,760,000; W.B.C. 8,180. In February, 1903, just before operation, the count was Hb. 25 per cent.; R.B.C. 1,615,000; W.B.C. 7,060. One week after operation Hb. was 35 per cent.; R.B.C. 2,565,000; W.B.C. 26,000. Ten months later Hb. and R.B.C. had reached normal and W.B.C. were down to 11,000. The counts taken two, five and nine years later were normal in every respect. In 1911, when the last count was taken there had been no return of symptoms.

These two cases indicate the necessity of bringing the subject forward for discussion.

#### SUMMARY.

Traumatic Erb's paralysis in the adult is by no means rare.

The cause is practically always a forcible wide separation of the head and neck from the corresponding shoulder.

The resulting lesion consists of torn deep cervical fascia, torn nerve sheaths, torn nerve fibres, torn vessels with resulting blood-clot. All of these elements combined form a cicatrix or cicatrices which interfere with nerve regeneration and function.

In nearly all cases the injury involves the roots in order from above downward, and the maximum injury is to the upper roots.

The roots may be torn from the cord, although fortunately this is not so very common. The cicatrices in the other cases may be small, large, single, or multiple, and may be located anywhere from within the intervertebral foramina out to the distributing trunks which arise from the plexus.

The symptoms depend upon the situation of the cicatrices and the number of roots involved. The paralyzed muscles fall into groups which correspond with the plexus roots from which they derive their innervation. The sensory symptoms are neither so definite nor so wide-spread as the motor, and they are apt to disappear much sooner. The completely paralyzed muscles show R. D., while the less completely paralyzed ones show various degrees of sluggishness to the testing currents. The lesion can always be felt through the skin by the examining finger.

The prognosis, where there is a real lesion, is distinctly bad without operative repair. With prompt operative repair the outlook is much improved, but a really perfect result is not to be attained in many cases.

The only rational treatment consists in prompt exploration with such repair of nerve structures as may be indicated in

plished. It undoubtedly holds out more chances for permanent relief and would seem to be the most rational procedure in the ascitic stage. The attempts are yet too few to state the results with any accuracy.

*Complications.*—The convalescence following splenectomy varies in no way from that following any operation on the upper abdomen except in two points: First, the danger of gastro-intestinal hemorrhage and second, the lowered resistance to any secondary infection. Hemorrhage into the stomach or upper intestines is the most common as well as the most severe complication. It may occur immediately after operation or at any time during the first two weeks. The loss of blood may be rapid, or as is usually the case, the leakage may be slow, persistent oozing from the mucous membrane of the stomach and upper intestines. It is the most common cause of death in the first two weeks. The frequency of its occurrence cannot be readily estimated. Urbino lays emphasis upon it and noticed it in five out of seven cases. Mayo mentions it as a cause of death in the only fatal case in his series. The treatment consists in absolute rest of the upper gastro-intestinal tract; injections of saline, vasoconstricting drugs, blood serum, or even direct blood transfusion. A case of Dr. Donald Guthrie's, operated upon during the past year, may be cited as typical of this condition.

This case, a young adult male, was seen by Dr. Guthrie in November, 1911. The examination at this time showed a case of splenic anæmia of three years' duration, in the second stage. The blood picture gave a haemoglobin of 46 per cent.; R.B.C. 4,230,000; W.B.C. 5,600. The lower border of the spleen extended into the pelvis. Splenectomy was performed. During the first five days after operation the recovery was uneventful. At this time he began to pass small quantities of blood by the bowel. This lasted two days and was controlled by injections of normal blood serum. Patient then had no trouble for one week and was able to be up and about in a wheeled chair. At that time he again had attacks of bloody diarrhoea and in spite of saline and blood serum injections the hemorrhage recurred and he died three days later. A post-mortem was made. The vascular pedicle of the spleen was found to be in good condition. In the lower half of the small intestine the mucous membrane showed innumerable small hemorrhagic areas. The mucous membrane of the stomach and of the upper small intestine showed congestion but no hemorrhage.

SPLENIC ANÆMIA, WITH SPECIAL REFERENCE  
TO ETIOLOGY AND SURGICAL  
TREATMENT.\*

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SPLENIC anæmia, although recognized as a pathologic entity even in the early years of the nineteenth century, presents to-day many unsolved problems. This condition has been described under various names during the past twenty-five years but at the present time splenic anæmia is the generally accepted term. By it we mean a disease of long duration, generally lasting several years, characterized by an anæmia of the chlorotic type, considerable enlargement of the spleen without known cause, an absence of leucocystosis and a tendency to gastro-intestinal hemorrhage. In the advanced stage, cirrhosis of the liver, ascites and jaundice are also present. Banti, Osler and others have fully described the course of the disease and divide it into three distinct stages.

The first stage lasts two to ten years, with splenomegaly, anæmia, gastro-intestinal hemorrhage and pigmentation of the skin as its prominent symptoms. The second stage lasting only a few months adds to these symptoms kidney insufficiency with scanty high-colored urine. The third and terminal period presents the stage of liver involvement in which appears a cirrhosis of the Lænnec type with its accompanying ascites.

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\* Read before the Philadelphia Academy of Surgery, May, 5, 1913.

is correct, we suggest that the blood coming from the spleen to the liver should be doubly toxic in that it contains not only the primary toxin, but that also elaborated by the splenic substance. To our minds it is the action of this doubly toxic blood that causes the endophlebitis of the splenic and portal veins with its consequent thrombosis.

5. In all probability these same toxic factors play the important rôle in the production of liver cirrhosis, although the mechanical factor of congestion of the portal system may be an additional cause.

6. Up to the present time treatment other than surgical has yielded only temporary benefit.

7. Splenectomy in the first and second stages offers us our only chance of permanent cure. The mortality is 12.5 per cent.

8. Splenectomy in the third stage will arrest the further development of the disease but will not cause a retrogression of the liver cirrhosis. In a few isolated cases of early cirrhosis permanent cure has followed removal of the spleen. In the past five years mortality following splenectomy when done in the third stage has been 56  $\frac{1}{4}$  per cent. The combination of splenectomy and Talma's operation should be the procedure of choice in this stage.

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haemolytic poisons (pyridine, etc.). F. Bartazzi has also shown increase in the red blood corpuscle resistance in splenectomized dogs. Pagliesi and Tuzzati, later Charrin and Moussie, and later still Gaucher, have shown that splenectomized dogs have a considerable lessening of biliary secretion. The logical conclusion is that the spleen has a great influence on haemolytic and bilogenic processes not only because it diminishes red cell resistance and prepares them for destruction in other organs, but because it destroys them directly and forms thereby the necessary substances for biliary secretion.

The part that the enlarged spleen plays in the production of the anaemia has given rise to other theories. Harris and Hertzog believe that by reason of an erythrolytic enzyme secreted by the endothelial cells of the hyperplastic spleen there is a destruction of red blood corpuscles, and cite splenectomy with its cure to substantiate them in their position. Barr thinks that an increased blood supply to the spleen, with its consequent fibrosis, causes increased haemolysis. The congestion is explained on a theory of vasomotor paresis of the splanchnic area from disease of the visceral sympathetic ganglia. Lintvarev believes that the anaemia is due to an increased destruction of the red cells by the erythrophages of the spleen, which cells have been produced in excessive numbers because of certain poisons (exogenous as well as endogenous). Rolleston would explain the anaemia upon an inhibition of blood formation due to the endothelial hyperplasia found in the enlarged spleen. So, while opinions differ as to the actual manner of accomplishment, it seems reasonably certain that the spleen causes the anaemia. Banti's theory of increased haemolysis brought about by lessened resistance of the red blood corpuscles so that they are destroyed in greater proportion in the liver, lymph nodes and spleen itself, seems to us the most satisfying, since it is based on reliable experimental evidence and clinical findings. In these cases we have icterus without decoloration of the faeces, and we find that in periods of aggravation of the disease a further diminution of

## **EXACTNESS IN DIAGNOSIS AND CONSERVATISM IN TREATMENT OF RENAL CALCULUS.**

**BY PAUL MONROE PILCHER.**

IN the past the efforts of surgeons to remove a calculus from the kidney have been accompanied by considerable traumatism to the organ itself. The kidney has been roughly handled, its parenchyma laid open, and the finger used to explore the various calyces and the renal pelvis. All of these procedures are unquestionably dangerous, and prompt the question: How can the surgeon avoid them and still remove the calculus from the kidney? In answering this question it may be said, first, that every means possible should be employed to establish an exact diagnosis, and that one should never operate upon a patient for renal calculus, basing his diagnosis on subjective symptoms alone.

So typical is the picture in many cases that few clinicians could fail of a correct diagnosis. However, when a surgeon has seen a number of patients suffering with the usual symptom complex, and yet has failed with the X-ray, cystoscope, or by operation to disclose a stone, he realizes that there are other conditions, some even entirely outside of the kidney, which may cause the symptoms. Gall-stones are seldom confusing; chronic appendicitis with a pericæcal veil of adhesions extending upward toward the kidney frequently is; perirenal adhesion, subcortical hemorrhages, acute congestion of the kidney causing a stretching of the capsule, and acute inflammatory diseases of the pelvis and parenchyma of the kidney are the most frequent conditions which simulate the symptoms of renal calculus.

Pain in the kidney not affected has frequently been observed. Personally, the writer has seen only one or two cases in which the excruciating pain of renal colic was referred to

nervous influences from the central or sympathetic nervous system, but that its stimulation depends largely upon the circulation of systemic blood which comes in direct contact with the parenchyma of this organ. Further, that a part of its physiologic function is to sift out from the circulating blood bacteria, toxins and other detritus. These facts offer additional theoretical evidence of the probable toxic nature of the primary irritant.

Certainly one of the most interesting problems to be solved is the connection between endophlebitis of the portal and splenic veins and the enlarged spleen. Is the thrombosis primary or secondary? That some relation exists is reasonably certain, because of the frequency with which thrombosis of the portal and splenic is found at autopsy in cases dying of splenic anaemia. The reports of Dock and Warthin, Oettinger and Fiessinger, Banti, Rolleston and many others amply attest this fact.

It was really to attempt to shed additional light on this phase of the question that led the authors to carry out experiments on animals.<sup>1</sup> Our aim was first to produce thrombosis of the portal and splenic and later to study the splenic changes and blood picture. It seemed easy to ligate the splenic vein and cause a passive congestion of the spleen which would, in a measure, at least reproduce what actually occurred in cases of portal and splenic thrombosis. This we did in seven dogs, and found that in every case the immediate enlargement of the spleen was enormous, but in none of our cases did this increase in splenic dimensions last longer than one month, to be followed by permanent atrophy of the organ. The results coincide with Warthin's earlier ligations of the splenic vein. In another series of three dogs and two rabbits ligation of the splenic veins and injection of aleuronat directly into the splenic pulp were tried. Here again, in every instance, temporary increase in the size of the spleen followed with local necrosis of the splenic pulp at the injection sites. The splenic congestion with its consequent enlargement gave way to permanent atrophy. The aleuronat was used to supply an irritant and was chosen because we wished to produce an inflammation that would stop short of pus formation. Feeling that ligation, with its sudden congestion, did not reproduce the actual pathological condition, we attempted partially to occlude the lumen of the splenic vein. This we did by metal clips and loosely tied ligatures in a series of three dogs. Slight enlargement of the spleen occurred temporarily, to be followed in three weeks by a return to the normal size. Having failed with the splenic we next tried, in a series of five dogs, to produce portal thrombosis by exposing the vein,

<sup>1</sup> All experimental work on animals done under ether anaesthesia.

FIG. 3.

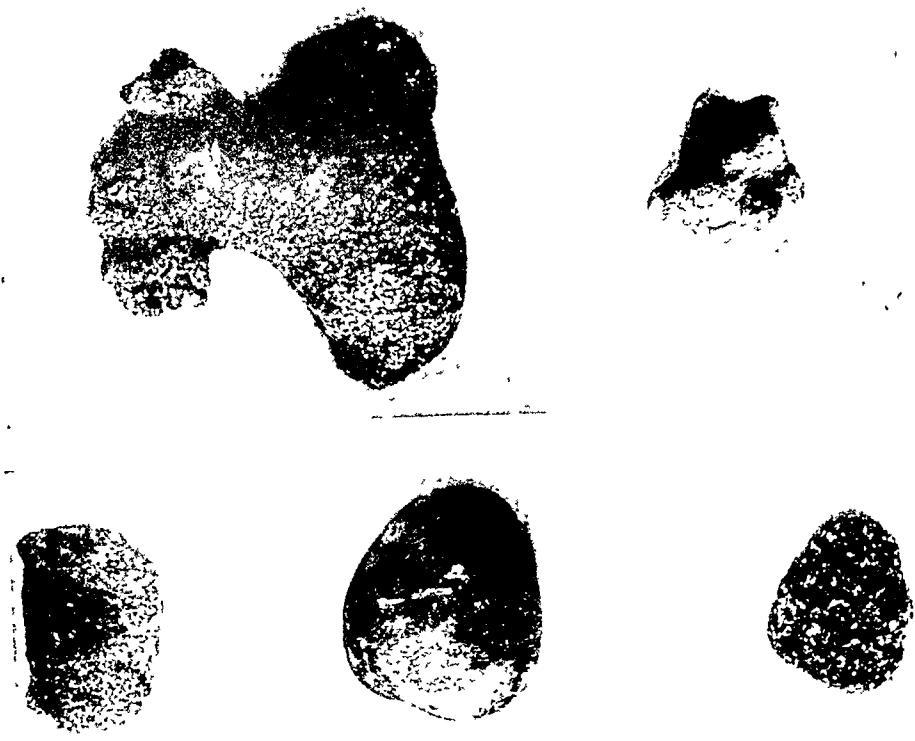


Plate showing variety of shapes and sizes met with in cases of renal calculus.

Stones which originated in the kidney, gave rise to repeated attacks of renal colic and were passed naturally from the urethra without operation.

generation of the red cells, with the occasional finding of normoblasts and myelocytes. Secondly, an enlargement of the spleen which weighs on an average 61 ounces. It retains its normal shape, is dense and firm and under the microscope shows a general fibrosis, especially of the malpighian bodies, which are sclerosed and atrophied and often show hyaline degeneration. In addition, the blood spaces show marked hyperplasia of the endothelial cells and many large phagocytic cells, spoken of by Lintvarev as macrophages. In the third stage the liver shows a varying degree of atrophic interlobular cirrhosis, closely corresponding to that seen in chronic alcoholism. In addition, in a large majority of cases, there is reported an obliterating thrombophlebitis in various stages of degeneration of the splenic and portal veins, which often show almost complete obliteration of the lumen.

*Treatment.*—In the treatment of splenic anæmia, as in its etiology, a great diversity of opinions is met with. Medicine and surgery have had their advocates and opponents. With the rapid advance of surgical technic in the past few decades, the operative treatment now offers the greatest chance for permanent recovery.

In the medical treatment, iron and arsenic stand pre-eminent. They are of undoubted value in combating the anæmia and in improving the general condition, but at the best they are only temporary aids and in no way counteract the causal factor. Up to the present time literature shows no cases of permanent cure by medical treatment alone.

As our knowledge of the etiology of this condition advances, the medical treatment will of a certainty become more valuable, especially in the early stages. If we can but discover the primary intoxicant and attack this before the spleen is permanently damaged, our therapeutic agents will become powerful factors in what may be called the prophylactic treatment of splenic anæmia. At the present time, the early eradication of any chronic source of intoxication, especially of the alimentary tract, must be of general if not of specific benefit to the patient. As an example, a case of one of the authors may be cited.

diagnostic value. It helps us also to determine the size of the renal pelvis.

*The Ureter Opening.*—During the acuteness of an attack, the sphincter of the corresponding ureter opening appears tightly contracted; after an attack is over, the meatus is more relaxed, congested, and, in some cases, swollen. Where a chronic pyelitis is present the picture does not differ from that accompanying other descending infections. The bladder mucosa is not altered unless infection is present. As a rule there is just sufficient change in the appearance of the corresponding ureter opening to determine the side on which the lesion is.

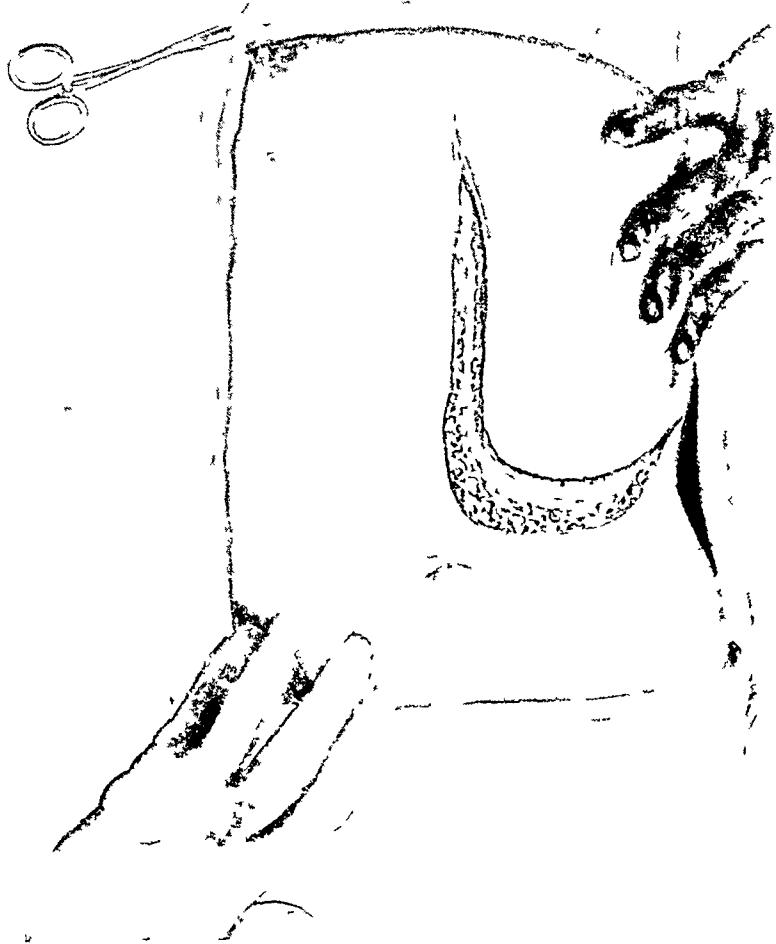
*Urinary Efflux.*—One seldom has an opportunity of observing this during an acute attack. In one case examined by the writer the diseased side showed a slow dribbling of urine, while the normal kidney was delivering urine to the bladder in strong, rapid spurts, showing the reflex stimulation.

*Functional Tests.*—In almost all grades of renal calculus the functional activity is impaired. The degree of the disturbance depends entirely on the individual case. The tests are important in determining the indications for treatment. The disease affects equally the phloridzin, indigo-carmine, and phenolsulphonephthalein tests. The greater the amount of renal destruction, the more advanced will be the functional derangement.

*X-ray Examination.*—This is insisted upon in every case in order to determine the size, position, and number of calculi present. *We feel that a calculus which is so small as to be undetected by repeated X-ray examinations is probably small enough to pass out without surgical operation.* A large single shadow may be cast by one stone or by a group of stones massed together. A number of shadows arranged along a vertical or oblique line usually indicate multiple stones in the dilated calyces of a hydronephrotic kidney, and are probably contained within the shell of a kidney which should be removed.

The X-ray helps us materially to choose the type of opera-

FIG. I



moved shows that a portion of the calculus has been broken off from the main mass, the remaining fragment can sometimes be removed by incising the calyx, or, if necessary, by a cortical incision. At any rate, the existence of such a stone is an absolute indication for operation.

Again *the urate stones are very frequently multiple*. On an X-ray plate we will sometimes find a large stone blocking the ureter opening, and below this shadow are seen indications of a number of smaller stones in the kidney substance. Such a picture would indicate a considerable destruction of renal tissue with the formation of dilated calyces, in the bottom of which are contained multiple calculi which are lower down than the one at the ureteropelvic junction. Such a case might well be approached by a combined pelvo-ureteral and cortical incision, for it is practically impossible to remove all the small stones contained within a dilated calyx through an incision in the renal pelvis.

TREATMENT.—A patient who has had only one attack of renal colic is not necessarily a surgical case; one might safely say that *there are more renal calculi passed into the bladder and through the urethra than ever remain imprisoned in the kidney*. The danger in making such a statement lies in the fact that when a physician comes to accept it, he is apt to treat a primary renal colic medically, hoping there will be no recurrence, and he does not insist upon a complete diagnosis, thus exposing the patient to the danger of harboring a calculus which is too large to pass, and which will eventually destroy the kidney. Therefore, in all cases of renal colic, an X-ray examination should be made, and a careful watch be kept upon the urine.

The X-ray has been especially valuable in differentiating cases of renal calculus which are surgical. For example, we often see cases of recurrent attacks of renal colic due to the formation of small renal calculi which are essentially not surgical cases. As an example of this class of cases I may cite the following:

FIG. 3.



Usually when the X-ray shows the stone contained within the substance of the kidney itself, the cortical incision alone is indicated.

The aim of the surgeon is to remove the stone with as little injury to the kidney as possible. The old fear of persistent urinary fistula following incision of the pelvis of the kidney is no longer present, for, as I will show later, the more advanced methods of operation have eliminated this.

I mention these facts and have tried to show how fairly accurate conclusions may sometimes be drawn from a careful study of the symptoms in combination with radiography, in order to emphasize the fact that they have a distinct bearing upon the character and safety and completeness of an operation for renal calculus. The subjective symptoms draw our attention to the condition. The urinary examination in combination with radiography and cystoscopy establish and define the exact diagnosis.

#### CHOICE OF OPERATION.

Our choice of operation is, first, pyelolithotomy; second, nephrotomy; and third, nephrectomy. Broadly speaking, *pyelolithotomy is indicated* in a case where the stone is situated wholly within the pelvis of the kidney, in the first portion of the ureter, or in the lower calyces of the kidney, provided the pelvis is dilated. It is *contraindicated* in a kidney which is bound down by strong adhesions so that it cannot be brought well into the wound; also where the fatty fascia surrounding the renal pelvis is friable and infiltrated with inflammatory exudate; it is *difficult* in those cases where a short pedicle is implanted high within the kidney. The short renal pedicle is not always a contraindication, provided the kidney can be well exposed. The operation is apt to be difficult in stout patients, but as one becomes more expert in operating upon the kidney it is possible to perform a pyelolithotomy without delivering the kidney into the wound.

*Nephrotomy is indicated* where pyelolithotomy cannot be performed, providing the parenchyma of the kidney has not

at least, has given us the best access to the upper left quadrant of the abdomen.

The incision used is a reversed "J" (see Figs. 1-5). The vertical portion starts one cm. to the left of the middle line, at the tip of the ensiform cartilage and is continued downward to the level of the umbilicus. It is then carried outward across the rectus and outward and upward toward the tip of the seventh rib. The rectus muscle is cut transversely, preferably at the linea transversa. The external oblique and the transversalis muscles are separated in the direction of their fibres; the internal oblique fibres are cut across. The flap can then be turned up and out giving free access to the splenic area.

We consider that this incision not only gives us the best operative exposure but also greatly lessens the dangers of post-operative hernia. The blood supply of the flap is not interfered with on account of the free anastomosis with the vessels of the chest. The nerves supplying this area, coming as they do from the lower intercostals, run parallel with the transverse portion of the incision and therefore are not cut across. The transverse incision of the rectus has already proven satisfactory and the splitting of two of the three layers of the lateral wall adds greatly to the post-operative strength.

Having obtained the proper exposure, the greatest remaining difficulty lies in the efficient ligation of the vascular pedicle. Mayo and Sutherland both strongly urge the use of a temporary rubber covered clamp on this pedicle before ligation and the thorough testing of the ligatures before the complete removal of the clamp.

Extrication of the spleen has been performed for various conditions by many operators and the consensus of opinion is that while the operation is a serious one with high mortality, it is entirely justifiable under certain conditions. The statistics for splenectomy from any cause compiled by Bessel Hagen in 1900, and by Johnson in 1908, show a mortality of 36.3 per cent. in a series of 353 cases and of 18.5 per cent. in a series of 355.



In the third stage however, we find a very different story. Here the results of a chronic poisoning have asserted themselves. The vital organs are showing signs of permanent degeneration. The liver has become cirrhotic and we are dealing not with an anæmia alone, but with a degenerative process affecting many organs. Nothing we can do to the spleen will restore the liver cells already destroyed, or prevent the symptoms arising from such destruction. All that we can hope for is to prevent further degeneration. For this reason splenectomy in the third stage has given much poorer results than in the early stages, although a few isolated cases have been reported showing complete recovery in early third stage following splenectomy. In 1908 Simmonds reported six cases following splenectomy, with four deaths, and Torrance five cases with four deaths, giving an average mortality of 72.7 per cent. In the past four years sixteen cases are reported with 9 deaths, giving a mortality of  $56\frac{1}{4}$  per cent.

It is perhaps unfair to place too great reliance on the statistics just given. In a disease as rare as the one under discussion, it is extremely unusual to find more than one or two cases reported by a single author. Only the very largest clinics can report a sufficient number of cases to make the statistics reliable. The majority of the single cases reported show a favorable result and it is only reasonable to suppose that many terminating unfavorably have not found their way into literature. However, in the past two years, two articles reporting a series of cases have been published and on this account should perhaps deserve special mention. Mayo, in 1910, reports ten cases of splenectomy for enlarged spleen. Seven of these were undoubtedly splenic anæmia, five being in the early stage, and two in the terminal stage; of these, one resulted fatally and was a case showing advanced cirrhosis of the liver and ascites. The other article by Urbino comes from Burci's Clinic, in Florence, and reports seven cases in the early stages with one death, and two cases in the terminal stage, both of which died.

In the past few years the combination of splenectomy and Talma's operation has been suggested and successfully accom-

night and day; is never free from desire to urinate. Paroxysms of pain start in the region of the left kidney, pass down the left side to the bladder. Need of urination every few minutes at such times. Later the pain was severe in the bladder.

*Cystoscopic examination*, September, 1912, showed the bladder to be normal; no obstruction in the ureters; urine from left kidney contained blood. Examination of the bladder urine showed pus and blood to be present.

*X-ray examination* by Dr. Eastmond in September showed a branched stone in the right kidney and multiple stones in the left kidney. An X-ray examination by Dr. Caldwell, of New York, some weeks later, showed left kidney clear, an oblong stone in the left ureter near the bladder; branched stones in the right kidney.

In the history given there was no complaint referable to the right kidney and yet the X-ray shows in it a collection of stones which is very striking. A more close cross-examination of the patient brings out a history of previous symptoms pointing to the right kidney. These are not of recent date, but more probably deal with that period when the original stone was forming and small bits of stone or large collections of crystals were passing along the ureter (Fig. 14).

At the present time attention is drawn toward the left kidney because a stone has entered the ureter and is making its way downward to the bladder. The first attack of pain is evidenced when the stone engages at the ureteral intake. This portion of the ureter is very dilatable and with the continued spasm of the walls of the renal pelvis and the added dilatation due to the blocking of the ureter the stone is gradually forced downward, being arrested either at the brim of the bony pelvis or, passing this, engaging at the ureterovesical junction. So we may explain the symptoms in this case. The relatively small cylindrical stone with blunted ends shows clearly in the picture. This X-ray shadowgraph tells its own story. It demonstrates most strikingly the difference between the shadow of a ureteral stone and that of a phlebolith. Many opinions to the contrary, the relative positions of the stones are quite characteristic. The pelvic ureter seldom varies its position and is far nearer the median line than the veins which contain phleboliths. Then again, the phleboliths are usually multiple, round and clear-cut, while the edges of an impacted stone are blurred by the inflammatory exudate occasioned by its pressure in the ureter; ureteral stones are usually single.

The danger of secondary infection can perhaps be classed as a post-operative complication. There is undoubtedly a lower resistance to any of the pathogenic organisms, which lasts for months after the removal of the spleen. This fact has been amply proven both by the clinical findings and by experimental work on splenectomized animals.

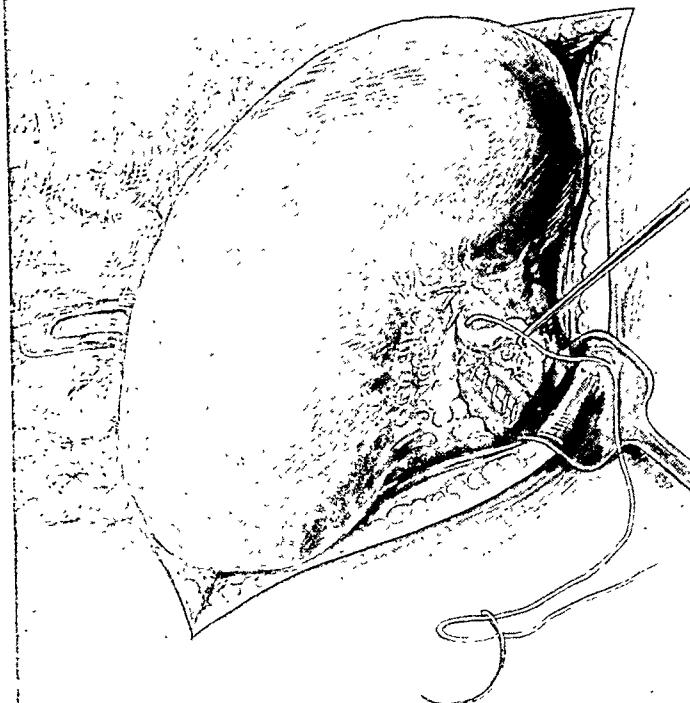
A case operated on by Dr. C. H. Frazier, in the Hospital of the University of Pennsylvania, during the past winter, is a good example of this condition. A colored girl, aged eighteen years, with a splenic anaemia in the first stage was operated on and the spleen removed. Her convalescence was uneventful until the tenth day when she began to run a temperature and developed signs of pneumonia and pleural effusion at the left base. This was followed three days later by an empyema which was tapped and a few ounces of sterile turbid fluid removed. The chest condition gradually improved. Thirty days after the operation she began to develop signs of gastro-intestinal disturbance with vomiting, distention, etc. Three days later dulness in the flanks developed. The abdomen was opened in the suprapubic region and a large pocket of thick, green, foul-smelling pus evacuated. The upper abdomen seemed to be walled off from this pocket. Six weeks later the patient's general condition had markedly improved, although there was still slight drainage from the abdominal wound.

*Conclusions.*—1. Splenic anaemia is a disease entity characterized by a definite symptomatology and pathological picture, and the so-called "Banti's disease" is its terminal stage.

2. In all probability the primary cause of splenic anaemia is a toxæmia, the origin of which is to be sought for outside the spleen itself, possibly in the gastro-intestinal tract, but the exact nature of which is as yet unknown. This toxin probably acts primarily or secondarily on splenic cells, causing an hypertrophy and increased activity.

3. This increased splenic activity is responsible for the anaemia probably through a decreased resistance of the red blood corpuscles. The icteric pigmentation is also due to an increased haemolysis.

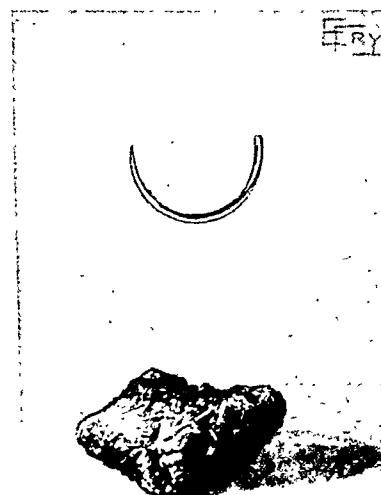
4. Although the thrombophlebitis of the splenic and portal veins is a frequent finding clinically, we believe, from our own experimental work and that of others, that it is not an essential factor in the etiology. If the theory of a primary toxin



*Paul Pilcher*

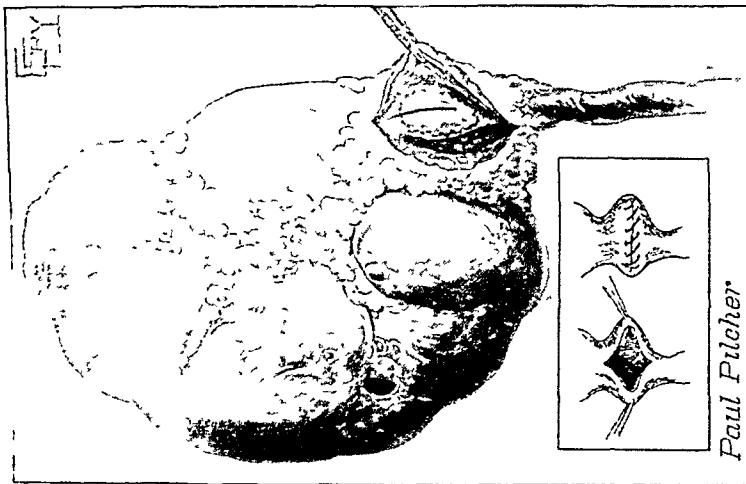
Last step showing the pelvis of the kidney sutured by a running catgut suture and the fascial flap being sutured over this. The two lines of suture only cross at one point.

FIG. 9.



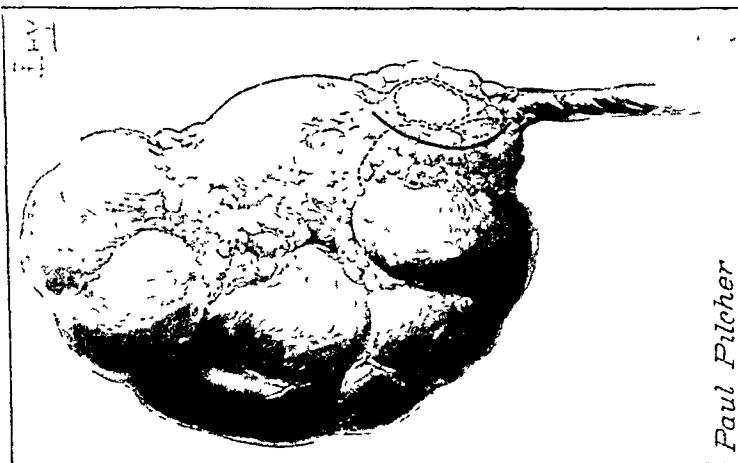
A small round well curved needle is used to suture the opening in the pelvis of the kidney and the fatty fascia. Below is shown a stone removed from the kidney pelvis by pyelolithotomy.

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*Paul Pilcher*

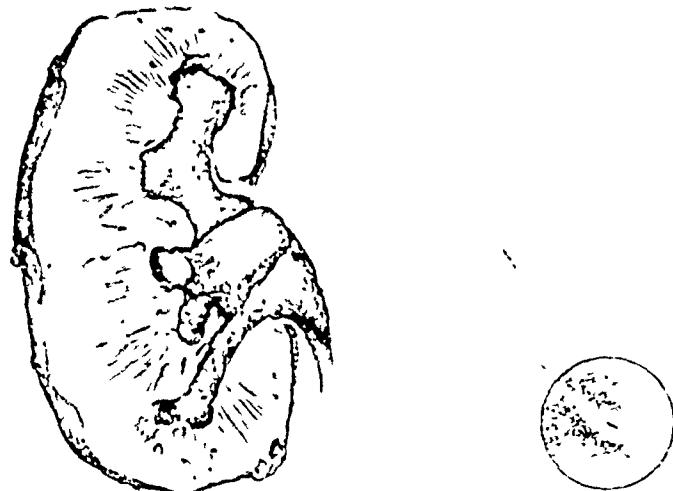
Second step in a case where the stone is impacted and immovable at the pelvo-ureteral junction. After the site of the constriction has been exposed a vertical incision is made across the neck of the constriction, exposing the stone directly, which is removed through this opening. The smaller diagrams show the manner of closing this wound; the upper and lower angles of the wound are drawn together and the wound sutured in such a manner that the line of incision becomes horizontal, instead of vertical, thus causing a dilated portion of the ureter where a stricture previously existed.



*Paul Pilcher*

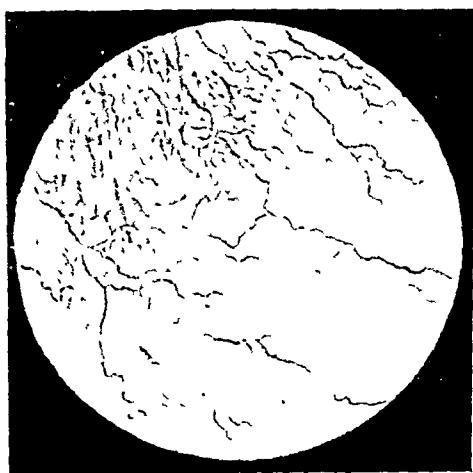
Showing the stone impacted and immovable at the pelvo-ureteral junction. In this case a curved incision is made through the fatty fascia, exposing directly the site occupied by the stone.

FIG. 1.



Kidney with large branched stone filling pelvis and appearance of corresponding ureter opening. (Pilcher's Cystoscopy.)

FIG. 2.



Cystoscopic picture of ureter opening corresponding to a kidney containing a stone in its pelvis. (Pilcher's Cystoscopy.)

the lower of the two larger calculi having two projections not shown without the stereoscope. These extended anteriorly. There were in addition small calculous patches in the neighborhood of the upper one of the larger stones. The shadow of the calculus shown in the left ureter at the first examination made in December had disappeared and it was thought that the calculus had passed.

Functional test made February 10, 1913, showed both kidneys to be normal in function. Bladder urine, 1.016; strongly alkaline; moderate amount of albumin; traces of blood and large quantities of muco-pus with triple phosphate crystals. Urine from right kidney contained pus and blood. Urine from left kidney some blood, no pus, and an excess of large lymphocytes.

The problem, then, had reduced itself to the condition of the large branched stone in the right kidney (Fig. 15). We did not feel that pyelolithotomy was impossible even in the presence of such large calculi as these, and we therefore determined to try it in this case.

*Operation: Pyelolithotomy of Right Kidney.*—February 11, 1913, by Dr. P. M. Pilcher, ether by Dr. W. C. Woolsey. The usual operation was made for exposing the right kidney, freeing the attachments of the last rib in order to retract it upward. It was possible to reach the renal space without cutting across any of the muscle structures. The kidney was freed and brought up into the wound, the fascia and fatty tissue dissected away from the pelvis and a  $\frac{3}{4}$  inch incision made through the pelvic wall which was found to be thickened. The finger was passed through this opening and gradually the stone occupying the lower part of the kidney was freed and removed with forceps. This stone measured one inch in length and  $\frac{3}{4}$  of an inch in width and was branched, fitting into the calyces. A small fragment which had been previously broken off was removed and then the upper large branched stone was gradually freed by pushing the wall of the dilated calyces away from the stone and was delivered through the opening. This upper stone measured  $1\frac{1}{4}$  inches in length, at its base was one inch across, at its middle point was  $\frac{3}{8}$  inch across and at its upper end was  $\frac{3}{4}$  inch across. By the finger introduced through the opening in the pelvis a search was made of the remaining portions of the pelvis, but no other concretions were found. The opening in the renal pelvis was closed by a single running suture of silverized catgut. The kidney was replaced. A cigarette drain was carried down to the suture line;

the wrong side, but he has often noted that between or immediately following attacks of renal colic, from whatever cause, the sound kidney will ache and give more trouble than the diseased one. This probably is due to the compensatory hypertrophy or acute congestion arising as a result of its unusual activity during the renal spasm of its companion, aided by a renopelvic nervous reflex.

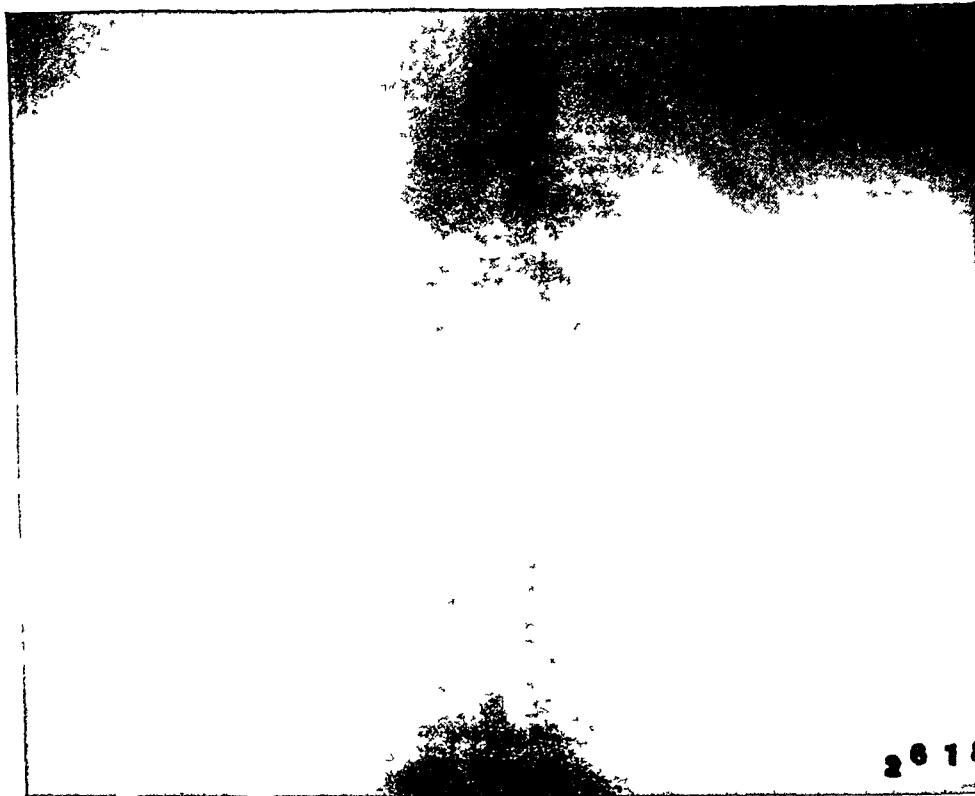
#### THE DIAGNOSIS.

Following out the practice that one should never operate upon a patient for renal calculus, from a diagnosis based on subjective symptoms alone, it may seem strange to specify that in every case a urinary examination should be made, but it is a fact that some surgeons will operate upon a kidney for supposed renal calculus, basing their opinion entirely on the subjective symptoms and physical examination alone. Moreover, it is not to be overlooked that there are cases in which all the typical symptoms of renal calculus are lacking, the affection not being discovered until much damage has already been done to the kidney.

In all cases of suspected renal calculus it is possible to determine by urinary examination: the presence or absence of blood in the urine; the presence or absence of pus in the urine, and its amount; the existence of a chronic or active nephritis. The *cystoscope* is useful as a minor aid to diagnosis in these cases. The changes in the bladder are never sufficiently characteristic to be of value. The ureter catheter, with or without its waxed tip or metal point, is less useful than the *Röngten* ray, but may afford valuable confirmatory evidence.

The chief value of the cystoscope in renal calculus is to establish the functional activity of each kidney and, in connection with the X-ray, to determine the relation of the stone to the renal pelvis; to determine the presence of a calculus in the ureter or bladder, and to demonstrate the condition of the bladder. We are dealing strictly with renal calculus. Where a calculus is descending the ureter, the cystoscope is of greatest

FIG. 16.



X-ray plate of kidneys in Case II. In the left kidney are seen three masses one at the pelvic outlet, one in the lower pole, and one in the upper pole. In the right kidney region are seen a mass of calculi the largest one of which occupies the pelvic outlet. It will be seen by comparing this stone with the vertebra that it is of enormous proportions. By referring to Fig 17, the stereoscopic picture the relatively larger size of the kidneys can be seen.

tion suited to the particular case. For example, an oxalate stone gives one of the densest shadows on an X-ray plate. An oxalate stone is slow in its development, is usually situated low down in the renal pelvis, and is easily removed by pyelolithotomy. Therefore, if we have a patient who has repeated attacks of renal colic, or a fixed loin pain, with occasional haematuria, with a urine that is loaded down with oxalate of calcium crystals, in the absence of bacteria, and the X-ray shows a round-shaped stone below the free border of the ribs, one may be fairly certain that by a lumbar incision, a careful exposure of the kidney, and an incision of the renal pelvis on its posterior surface, the stone can be removed with little danger of a long-continued urinary fistula resulting. If, however, in a patient with the same symptoms and in whom the urinary findings are identical, we find an oval-shaped stone situated in the upper pole of the kidney, the shadow in the radiograph showing well above the free border of the ribs, it is fair to assume beforehand that the pelvis of the kidney is contracted by irritation, that the stone is situated high up within the kidney, and that it cannot always be satisfactorily exposed through the renal pelvis. Without attempting, then, in such a case to do a pyelolithotomy, a cortical incision limited in its extent will quickly and safely expose the stone and allow of its removal.

On the other hand, if the X-ray shows a triangular stone with the apex pointing inward or downward, in the presence of an alkaline urine, usually without haematuria and without a history of much pain or repeated colic, with an excess of phosphates in the urine, it is logical to conclude that the stone obstructing the pelvo-ureteral junction is composed of phosphates, and is the beginning of a dangerous branching stone which sooner or later will destroy the kidney itself. Such stones often have small branches which fracture easily and do not show on the X-ray plate. Under such conditions it is still often possible to remove the stone entirely through a restricted opening in the renal pelvis. If the stone when re-

of pus was obtained from the right kidney. The left ureter was catheterized and some urine containing less pus than that from the right kidney was obtained. There was emitted, however, from the left ureter opening large clouds of thick mucus. While the catheter was in place, the mucus oozed out by the side of the catheter into the bladder. The bladder capacity was more than 12 ounces and there were no lesions suggestive of tuberculosis; each kidney was found to be functionating equally. The right kidney was secreting a relatively large amount of pus and the left kidney a small amount, estimated at five times the amount of pus coming from the right kidney as from the left. Bacteriological examination of the pus from both kidneys showed a pure culture of *Bacillus pyocyaneus*. A vaccine was made from these cultures. Each kidney pelvis was drained and a drachm of 5 per cent. argyrol was injected. Phthalein test was made of the whole urine and it was found that a very small per cent. of the phthalein was excreted in the first hour, too little to be estimated. Methylene blue was also used, and only a very slight amount was excreted by both kidneys.

X-ray pictures were taken by Dr. Caldwell, of New York, and showed that the pelvis of each kidney was blocked by a large wedge-shaped stone. A smaller stone was in the lower pole of the left kidney and there was also one in the upper pole near the spine, the stone in the right kidney being the larger and the stone in the left kidney being half that size. The outline of the left kidney showed it to be fairly normal in size; its upper pole being occupied by a small round calculus and its lower pole by a collection of concretions which formed a calculus of considerable size. The right kidney was seen to be very greatly enlarged, being twice as large as the left kidney, and beside the large stones at the outlet of the pelvis there were two smaller stones in the calyces in the upper half of the kidney and a collection of concretions and small trash in the lower pole of the kidney (Figs. 16 and 17). The problem, then, which presented itself was primarily one of obstruction at the pelvic outlet of both kidneys with advanced destruction of the secreting tissues of both kidneys. However, as long as there was an obstruction at the pelvic outlet, it would be improbable that any improvement would be possible, therefore it was decided to relieve the obstruction at the pelvis of the more normal kidney, believing that, if this could be accomplished safely, the left kidney would re-establish its normal functions to a con-

CASE.—A man forty-one years of age, had had rheumatism since childhood; for eight years had suffered from indigestion, with pain in the back, persistent headaches, and nausea. Two years ago he had an attack of renal colic on the left side, with vomiting and high fever; pain at first on the left side and then on the right side; has had recurrent attacks similar to this, with pain originating on both sides and passing along the front down along the course of the ureters, ending in the bladder. The patient has had three or four very severe attacks for which morphine was used; has passed many small stones of different sizes and shapes from the bladder.

Cystoscopic examination revealed both ureters thickened as they passed through the bladder, and both the right and the left ureter openings were somewhat dilated; there was no stone in the bladder; specific gravity of the urine, 1.033; total acidity of the urine, using a N/10 sodium hydrate solution, of 90 (normal being 35 to 40); therefore urine intensely acid, and contained many large uric acid crystals and clumps of crystals; also contained blood, but no pus. Two calculi, which were passed the day previous, were fairly large and rough, typical uric acid calculi, the larger being nearly three-eighths of an inch in length and three-sixteenths of an inch in width. A careful examination of these calculi which were passed showed a broken surface, as if these pieces had been broken off from a larger stone. We had all the symptoms of a large calculus in one or both kidneys, from which occasionally small pieces would break off and pass out; and yet when an X-ray examination was made no calculus could be found in either kidney, either ureter, or in the bladder.

If the calculus is small and is evidently descending, it should be allowed to work its way down, if possible. When it arrives at the vesical portion of the ureter it may be necessary to inject oil around it, dislodge it by instruments, or enlarge the ureter opening to facilitate its escape.

When, however, the stone in the kidney is too large to pass, it should always be removed by operation even if active symptoms of its presence are lacking, providing the kidney is still functioning normally and the second kidney is not diseased. The three methods now employed for accomplishing this are: pyelolithotomy, nephrotomy, and nephrectomy.

pain. She was practically an invalid. At the same time the evidence which was presented showed us that both kidneys were very far below par, both in responding to the phenolphthalein test and the methylene blue test. After removal of the stone from the pelvis the reaction of the patient was all that could be asked. She felt well, passed a normal amount of urine, and was free from fever. However, after a few days the secretion of the kidneys failed and the patient died of renal insufficiency.

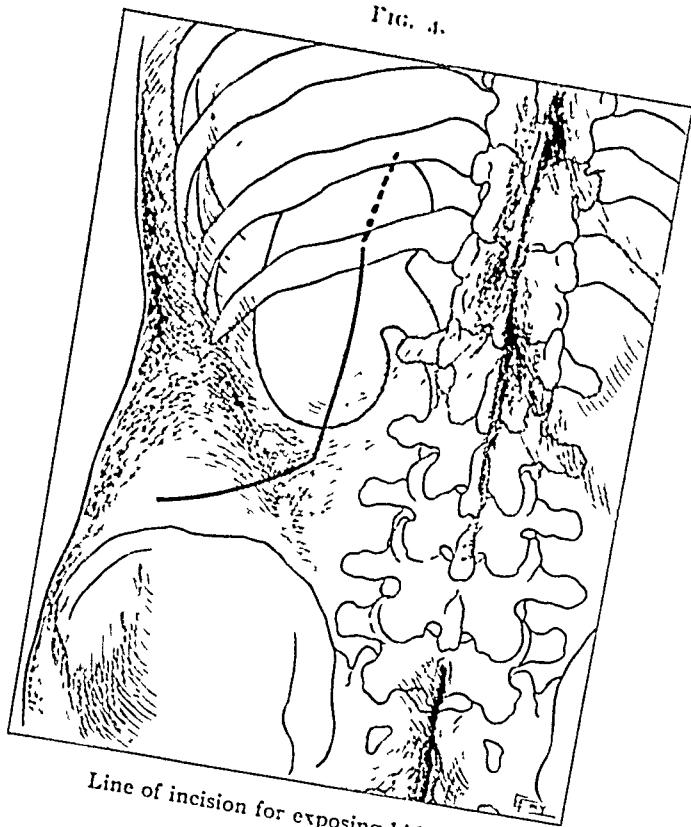
*CASE III.—*Pelvis and calyces of left kidney filled by calculus material.**

Patient, aged sixty-one, referred to us by Dr. Heebe, of Brooklyn. For a number of years has had typical attacks of renal colic referred to the left side. About twelve years ago he passed a number of small calculi. In September, 1909, patient had an attack of tenesmus and a fairly large calculus became lodged in his urethra. This was removed through an endoscope. Since that time has suffered constantly from a bearing down pain in the bladder, especially when constipated. There has been soreness ever since, and patient has much backache over both kidney regions. Urine shows no albumin, some leucocytes and triple phosphates. Cystoscope shows chronic cystitis of the base of the bladder; no residual urine; urine as passed proved to be alkaline. Second examination made after treating the bladder, swelling disappeared and both ureter openings were found to be normal. No stones in the bladder. Urine showed a large amount of pus with fair amount of albumin and relatively numerous renal cells.

X-ray by Dr. Caldwell shows a very large collection of calculous material in the left kidney, which fills the pelvis of the ureter and has branches into six or eight calyces, most of which are enlarged. The kidney showed itself somewhat enlarged. The right kidney shows nothing unusual, except that it is weaker than the left.

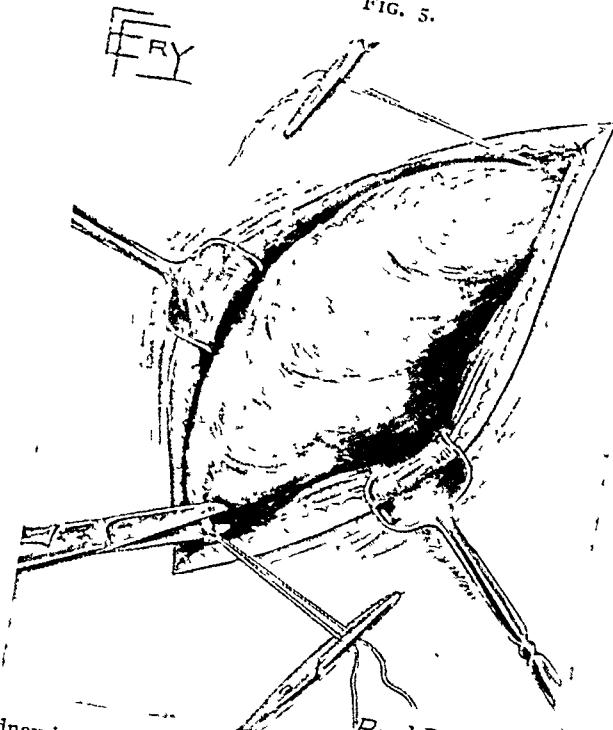
This case has not as yet been operated upon, and it is questionable whether the left kidney can be saved or not. The operation of pyelolithotomy is not to be thought of in this case on account of the extensive amount of calculous material filling the various calyces. The indication is to expose the kidney, remove the calculous material, and then determine the worth of the remaining kidney tissue. From the X-ray the pelvic outlet can be easily seen high up (Fig. 19).

FIG. 4.



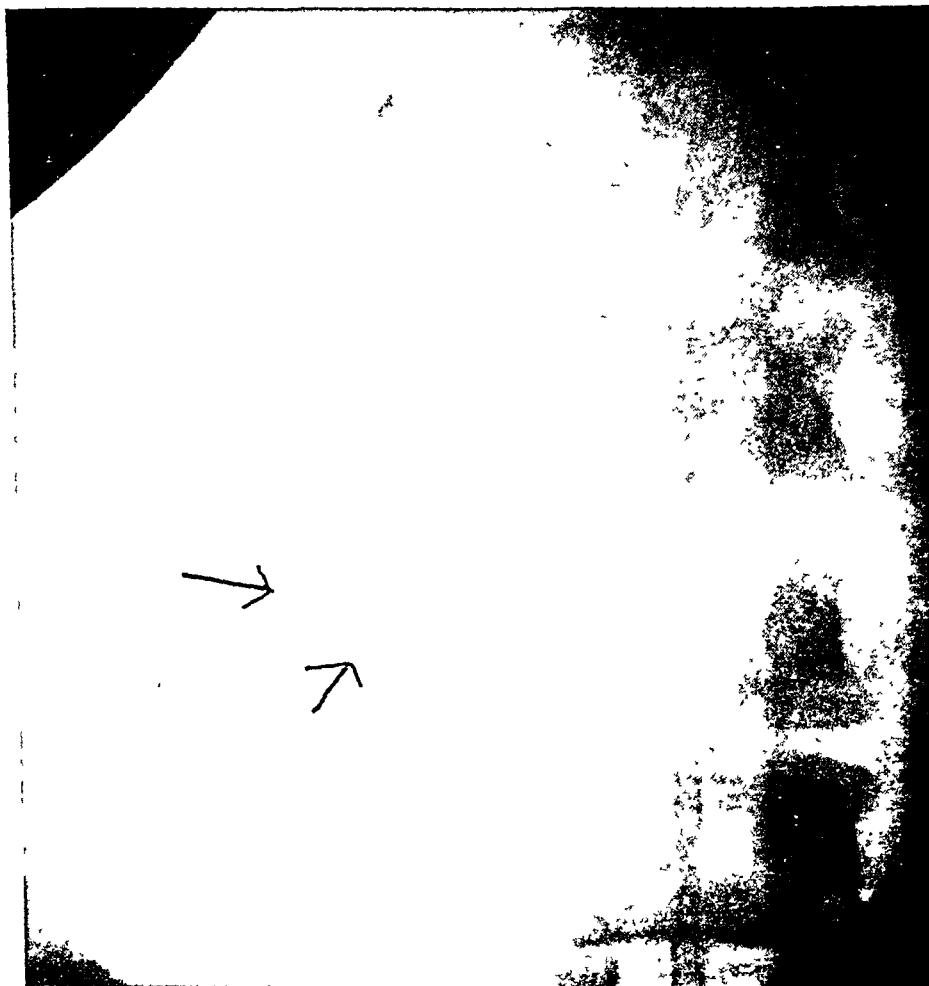
Line of incision for exposing kidney.

FIG. 5.



Freeing the kidney in order to bring it more freely into the wound. It will be found that there are generally vessels entering the kidney both at its upper and lower pole. In order to prevent hemorrhage from those tissues, whether they contain vessels or not, they are tied with catgut ligatures and divided.

FIG. 23.



Another case of calculus occupying the first portion of the ureter, the shadow showing it to be well below the free border of the ribs and therefore accessible to pyelolithotomy. This patient is yet to be operated upon.

been extensively destroyed, and providing suppurative pyelonephritis is not present. It is the writer's belief that the kidney which is the seat of a suppurative pyelonephritis should always be removed and never be incised, if the functional capacity of the second kidney will permit of it. It is a mistake to think that the shell of a kidney is of use to the human economy; it is rather a great source of danger, and will embarrass the second kidney, even if that, too, is partially destroyed.

The technic of pyelolithotomy is very simple, but the observances of general principles involved in the various steps of the operation are important to its ultimate success.

#### TECHNIC OF PYELOLITHOTOMY.

*Incision.*—The writer prefers an incision which begins two and one-half inches from the spines of the vertebra at a level with the last rib. It is continued straight downward to within an inch of the crest of the ilium, and is then carried forward parallel to the crest of the ilium. Considerable care is taken in making this incision. The incision parallel to the spines of the vertebra does not cut any muscle fibres, and the continuance of this "flail" incision divides the fibres of the external and internal oblique muscle (Fig. 4).

One of the most important details influencing the success of the operation of pyelolithotomy is a good exposure of the field of operation, and the original incision should be completed before the kidney is exposed, for in this way the muscles are best conserved. The kidney then is exposed in the usual way, is dislocated from its bed and brought into the wound, and a careful inspection of the kidney and pelvis is then made. If it is not possible to deliver the kidney, the case is one unsuited for pyelolithotomy, for, as I have stated elsewhere, the traumatism consequent to the delivery of the kidney which is bound down by dense adhesions of inflammatory exudate is more harmful than a clean cortical incision through the substance of the kidney.

Basing our steps on the diagnosis already established, we may meet with three distinct problems: First, one in which the

# TRANSPERITONEAL RESECTION OF A DIVERTICULUM OF THE BLADDER.

BY EDWIN BEER, M.D.,

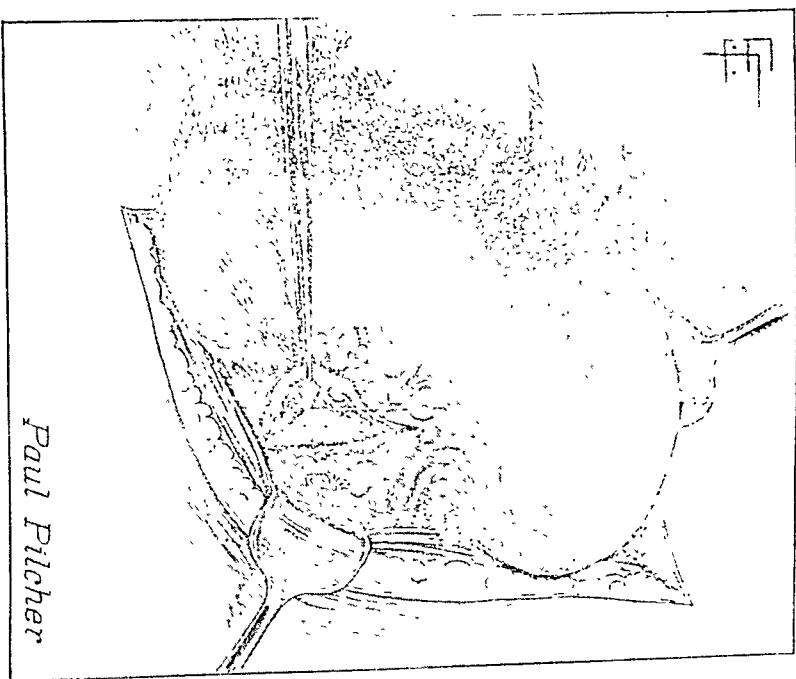
OF NEW YORK.

From the Genito-Urinary Surgical Service of the Mount Sinai Hospital.

ACCORDING to the excellent review of Wm. Lerche, in the ANNALS OF SURGERY, lv, 285, 1912, there are only 15 cases of excision of diverticula of the bladder recorded up to that date. Since then four more cases have been added during the current year, two by Chute, one by Bergener and one by Bryan. Of all these cases only four were approached by the intraperitoneal route, and most of these in a somewhat different manner from that employed in the case to be reported. The favorite method of approach has been the extraperitoneal route, pushing the peritoneum back from the bladder, and then cutting off the diverticulum or invaginating it into the bladder and then cutting it off through an opening in this viscus. To these four cases I wish to add a fifth, in which I was able to remove by the transperitoneal route without any great difficulty, perhaps the largest diverticulum that has been removed, and which went on to recovery without any accidents. As the method used in this case has some advantages, due to the better exposure and the more ready access, I have deemed it advisable to report it *in extenso*.

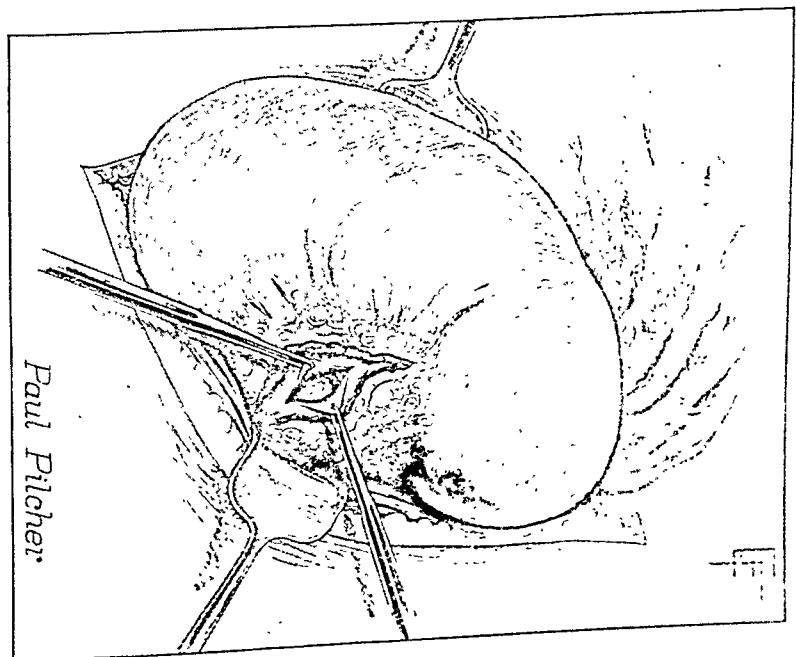
CASE I.—Male, thirty-five years. Well until ten months before admission to the hospital. At that time he says he caught cold, following which he had a urethritis. Discharge from urethra lasted four weeks, but the urine continued cloudy, and showed a sediment on standing. It had a foul odor. There was no dysuria, no haematuria, and no increased frequency. Seven months later he developed a swollen testicle on the right side. This lasted two weeks, and then disappeared. Three weeks before admission this testicle again became swollen. Throughout this time the urine remained as above.

FIG. 6.



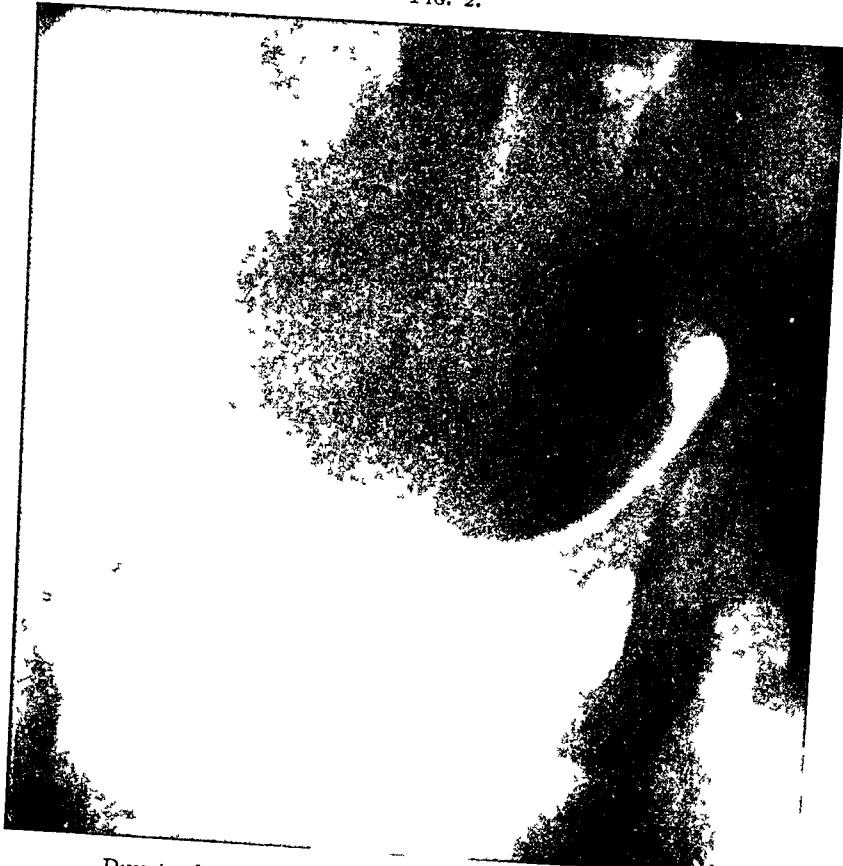
Showing the first step in exposing the renal pelvis after the kidney has been mobilized and brought into the wound; the posterior surface of the kidney is shown. A vertical incision is made through the fatty fascia surrounding the renal pelvis, exposing the external wall of the renal pelvis.

FIG. 7.



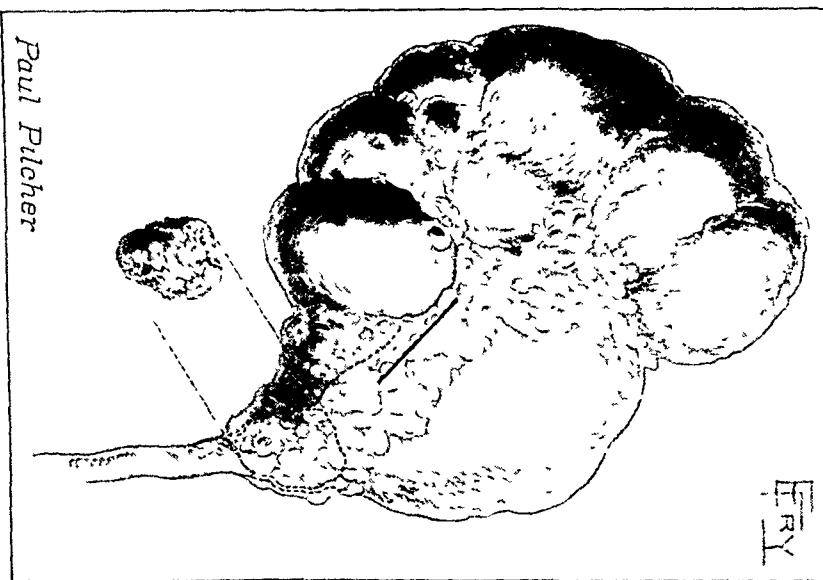
Showing the second step after the pelvis of the kidney has been exposed by an incision through the fatty fascia. A second incision is made through the wall of the pelvis, cutting down upon the stone directly, if possible. The stone is pressed through this opening and the incision in the renal pelvis is closed by a running suture of silvered catgut.

FIG. 2.



Diverticulum of bladder. X-ray with collargol. After excision.

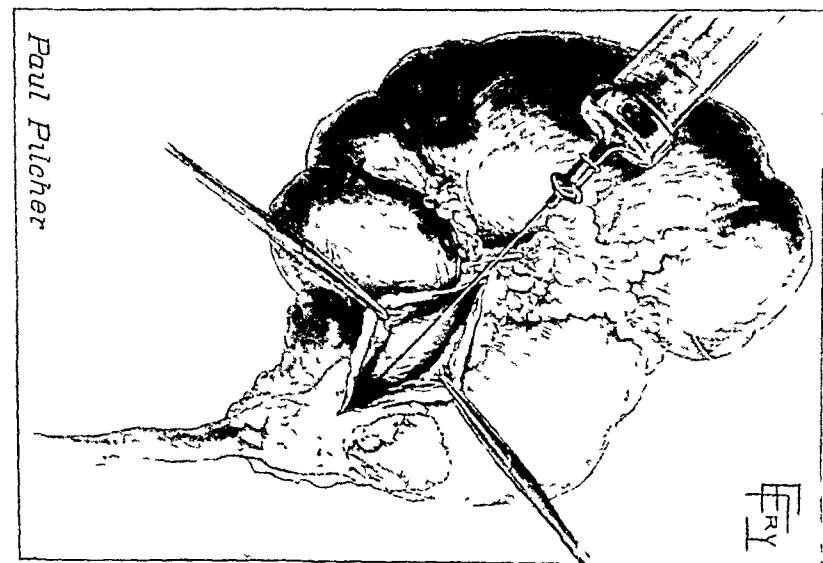
FIG. 10.



Paul Pilcher

The pelvo-ureteral junction is occupied by a movable calculus, and the pelvis is considerably dilated. The *first step* is the dislocation of the stone upward into the dilated renal pelvis; the *second step*, an incision made through the fatty fascia overlying the lower portion of the renal pelvis, exposing the wall of the pelvis.

FIG. 11.



Paul Pilcher

In a case where a movable calculus occupies the pelvo-ureteral junction. Second step, after the exposure of the wall of the renal pelvis an aspirating needle is introduced and the hydronephrotic fluid is removed. The wound is closed by a running silverized catgut suture, and the fatty fascia is sutured over the first suture line by a continuous suture.

Suture of the bladder wall and drainage of the retroperitoneal space by marsupialization with a tube.

To assist in the recognition of the right ureter, a catheter was introduced into this, and to allow of filling or emptying the bladder another catheter was placed in this organ. After thorough washing of the bladder, a 5-inch median laparotomy was made with the patient in Trendelenberg. The collapsed diverticulum was difficult to recognize and impossible to define. After filling the bladder with solution its shape and limits could be made out. It was then seen to be in part intraperitoneal, but the major part was extraperitoneal, in close relation with the structures of the pelvis. The whole wound was carefully protected (bladder empty again), and the neck of the sac which admitted three fingers, was cut down upon. The peritoneum and subperitoneal fat was cut through and the muscular wall of the sac reached. The sac was slowly dissected free from its overlying peritoneum, and no serious difficulty encountered until the more dependent parts were reached, where the diverticulum was found to be very adherent. The ureter was easily identified, and found directly in contact with the diverticulum and enlarged, permitting the catheter to move freely from side to side within its lumen. There was very little bleeding in this enucleation, and accidentally the diverticulum was torn into in the inflamed and adherent part. Clamps were placed on the bladder and the liberated part of the diverticulum, and the bridge was cut, and surfaces carbolized. Then the freed part of the diverticulum was cut away, and an attempt made to invaginate the small adherent piece that remained in the depth of the pelvis. This invagination was impossible and the remaining piece of diverticulum was removed by dissection from the deeper pelvic structures, the ureter, vas and vesicle. This was accomplished without any injuries, and then the bladder was closed in layers. The deep layer took in the mucosa and muscularis, and was of catgut, while Pagenstecher was used for the peritoneo-muscular suture. The large hole left in the retroperitoneal space was sutured in great part, and into the opening left a tube was placed. The edges of the peritoneum about this drainage tube were sutured to the parietal peritoneum close to the bladder, thus marsupializing the retroperitoneal space. The wound was closed in layers, and a permanent catheter left in the bladder.

The right kidney appears perfectly normal in conformation, its outline smooth and regular. It contains three distinct calculi and possibly a fourth which is overshadowed by the lower mass. Naturally the kidney is enlarged but the shadowgraph would indicate no area of destruction, its density being equal throughout. Also, if there was obstruction of the ureter at its inlet, a hydro-nephrosis would result and this would be shown by irregularities in the outline of the kidney. Studying the shadowgraph, therefore, we conclude that the right kidney is in its normal position, that its pedicle is not very long, that its pelvis is filled with a mass of calculi, and that these lie well imbedded in the pelvis and do not move downward and engage in the ureteral inlet.

Second, that there is a small cylindrical stone in the left ureter at the point where the ureter enters the bladder. The fact that the symptoms referable to the left kidney have abated is significant of the fact that the urine is passing the obstruction at present; further, that the stone may be removed in two ways, (1) by the vaginal route, and (2) by the transperitoneal route.

The indication in the present case is to remove the obstruction from the left ureter; later, to perform a nephrolithotomy in the right kidney.

In performing a vaginal ureterotomy it might be preferable to do the same transperitoneally in order to secure rapid healing of the wound of the ureter by the aid of the peritoneal exudates. Stripping up the peritoneum from off the ureter in exposing the stone should, therefore, be avoided, although it seems the logical procedure. An extraperitoneal ureterovaginal fistula is too easily established.

On October 9, 1912, another X-ray plate taken by Dr. Imboden showed the kidney shadows approximately normal in size, outline, and position. The right kidney contained three irregularly shaped stones, the two larger ones measuring  $1\frac{1}{4}$  inches long and the shortest one measuring  $\frac{1}{4}$  of an inch. There was also low down in the left ureter another stone. In January, 1913, the patient had another attack of discomfort in the region of the left kidney. This stopped suddenly and after that time the patient felt much better. February 8, 1913, another set of pictures was taken by Dr. Caldwell, who reported that the plates showed two large calculi branching into the calyces of the right kidney and a third calculus much smaller opposite the lower one of these two;

parietal peritoneum, close above the bladder, so that no band formation could take place between this and the posterior parietes and thus lead to a possible subsequent ileus. The close approximation of the redundant posterior parietal peritoneum to the bladder wall and the very small or shallow shelf thus produced, was, I believe, rapidly obliterated by adhesion to the suture line, which was also effectively protected in this way. The post-operative recovery was very satisfactory and the patient voided within twelve days sixteen ounces at one time. With the removal of this pouch the urine became much clearer and the patient began to pick up, so that within three months he felt perfectly well.

FIG. 14.



Stereoscopic X-ray plate showing calculi in Case I. The two distinct masses represent the stones in the right kidney. The outline of the kidney can be seen and is only slightly larger than normal.

FIG. 15.



Photograph of a reconstructed model, showing the stones in place after their removal from the kidney. A typical pyelolithotomy was done and through the small incision in the renal pelvis, as indicated in the photograph, the stones were successfully removed from the kidney without any injury to the kidney tissue itself.

## STATISTICS.

*Inguinal Hernia.*

	Right		Left
Male.....	34	Rec.	Male..... 6 } Rec.
Female.....	3 } Rec.	Female..... 1 }	
Male.....	10 } Died	Male..... 2 }	Died
Female.....	3 }	Female..... 1 }	
Recovered 44, died 16, not operated (died) 3, total..... 63.			

*Femoral Hernia*

	Right		Left
Male.....	0 } Rec.	Male..... 1 }	Rec.
Female.....	12 }	Female..... 5 }	
Male.....	1 } Died	Male..... 0 }	Died
Female.....	4 }	Female..... 2 }	
Recovered 18, died 7, not operated (died) 2, total..... 27.			

*Umbilical Hernia*

	Right		Left
Male.....	3 } Rec.	Male..... 1 }	Died
Female.....	8 }	Female..... 8 }	
Recovered 11, died 9, not operated (died) 1, total..... 21.			

*Ages of Patients.*

Age.	Inguinal.		Femoral.		Umbilical.		Mortality.
	Rec.	Died.	Rec.	Died.	Rec.	Died.	
I-10	5	1	..	..	..	..	16 per cent.
10-20	4	1	1	..	..	..	16 per cent.
20-30	8	0	4	..	..	..	0 per cent.
30-40	8	3	3	2	3	1	30 per cent.
40-50	7	3	4	2	3	3	36 per cent.
50-60	3	4	3	1	4	3	44 per cent.
60-70	8	2	1	1	1	2	33 per cent.
70-80	1	2	2	1	..	..	50 per cent.
Total..	44	16	18	7	11	9	

*Number of Hours Strangulated.*

Hours.	Inguinal.		Femoral.		Umbilical.		Mortality.
	Rec.	Died.	Rec.	Died.	Rec.	Died.	
I-12	21	1	7	0	4	1	5 per cent.
12-24	17	7	8	2	5	3	28 per cent.
24-48	3	2	2	2	2	1	41 per cent.
48-	3	6	1	3	0	4	76 per cent.
Total..	44	16	18	7	11	9	

a rubber tissue drain carried to the opposite side of the kidney, and a rubber tissue drain to the lower pole of the kidney. The wound was closed by layer sutures of chromic catgut with the exception of the point through which the three drains were brought out. Operation occupied an hour.

*Post-operative History.*—There was no leakage from the wound until about four days after the operation, at which time some urine leaked through the wound. This continued for about two weeks. Patient made a perfect operative recovery, and the wound healed entirely in about three weeks.

*After History.*—About three months after the operation patient had some renal colic on the right side, which passed off quickly. Since that time she has been perfectly well and has had no further symptoms of calculous disease on either side.

A model was made of the kidney after the operations with the stones in place, showing the opening in the pelvis through which the stones were extracted (Fig. 15). This case demonstrates that the operation of pyelolithotomy may be practical, even with a large branched stone.

CASE II.—*Hæmaturia; multiple renal calculi in both kidneys; pyonephrosis of both kidneys.*

Admitted to the Pilcher Hospital March 14, 1913. Patient referred to us by Dr. Weadon, of Bridgeport, Conn. She presented herself suffering from continued and exhausting hæmaturia, with frequent urination and a very marked pyuria with occasional attacks of severe renal colic on both sides. Thirteen years ago she was delivered of a child. Since that time she has suffered from three miscarriages. Following her child's birth she was in poor health for some time, headaches, distress in the back, general malaise. Ten years ago she was very sick, had chills, fever, and pain in the region of the right kidney. Since that time she has had more or less backache about the level of the second lumbar vertebra on both sides. Suffers from headaches, nausea, etc., normal. Some years ago an operation was done in the right lumbar region to expose the kidney, but no disease was proven at that time. She had been under treatment for months for supposed uterine trouble. Cystoscopic examination disclosed a fairly normal bladder without any distinct areas of inflammation. The right ureter was catheterized and urine containing a large amount

their absence due to an error on the part of the history taker in failing to record them. In almost every instance taxis had been tried by the patient and also by the attending physician.

The ages of the patients ranged from six weeks, the youngest, to eighty years, the oldest; and the duration of the hernia, non-strangulated, from two weeks to sixty years.

The condition of the patients on admission to the hospital varied, depending almost entirely upon the degree and length of time the hernia had been strangulated. The cases admitted in shock, with a subnormal temperature, fast pulse, etc., showed the highest mortality.

The diagnosis is usually easy. Only in one or two instances were the patients referred to us with an incorrect diagnosis, and these were either in small femoral hernias, or in inguinal hernias in which the attending physician recognizing a surgical condition had failed to make a thorough examination. In two instances the condition was mistaken for an appendicitis with diffuse peritonitis.

In any patient giving a history of a hernia coming down and not being able to reduce it, or an irreducible hernia becoming larger and more tense, and if either condition is followed by pain at the hernial orifice, colicky pain, nausea, and vomiting, a strangulated hernia should immediately be thought of. Speculations as to whether the hernia is irreducible, obstructed, inflamed or strangulated, depending on the passage of flatus, percussion sound, or the presence or absence of peristalsis in the hernial sac are misleading and the delay in waiting for such symptoms jeopardizes the life of the patient. The redness of the skin and the exquisite tenderness of the hernia, I believe, is often due to local applications, and too prolonged or vigorous taxis.

One often wonders, after operating on a case and seeing the hernial sac full of blood, and the bruised and injured condition of the intestine, if it would not have been better, certainly since the perfection of hernial surgery, if our medical schools would cease to teach the practice of taxis except in a few limited instances. Taxis, like all good things, is often

siderable degree and at some later date a similar operation might be performed upon the right kidney. It was felt that if no attempt was made to relieve the obstruction in the right kidney it might result in a complete disorganization of that kidney, while the chances of safely removing the obstruction and stone of the left kidney were far greater, and, if only one operation could be done, the best operation was the relief of this obstruction on the left side; therefore, under ether anaesthesia the operation was undertaken.

*Operation: Pyelolithotomy.*—March 22, 1913, by Dr. P. M. Pilcher, ether anaesthesia by Dr. Frank Sammis.

The usual straight lumbar incision was made with the arm extending forward along the crest of the ileum. The kidney was exposed and found to be densely adherent to the surrounding tissue, especially at its upper pole. The area at the junction of the middle third of the kidney showed marked evidences of destruction of the kidney tissue within the organ, and there was great danger of tearing off the upper pole of the kidney. With considerable difficulty the kidney was freed and its posterior surface brought up into the wound, the pelvic outlet exposed, the pelvis incised, and a large stone removed from the kidney pelvis without injury to the kidney tissue. The stone was as large as an English walnut. The opening in the pelvis was sutured with silverized catgut suture. Kidney replaced; cigarette drain to pelvis and rubber tissue to the lower pole. Wound closed around these drains. Patient stood the operation well. During the first 24 hours she passed about 45 ounces of urine.

*Further History.*—There was no leakage from the wound in the pelvis and the incision healed by primary union, excepting at the points where the drains led out. After the first five days of satisfactory post-operative course there were evidences of renal insufficiency. She developed a gastric type of uræmia evidenced by frequent uncontrollable vomiting and a gradually decreasing amount of urine excretion. This continued until death supervened twelve days after the operation. There were none of the ordinary evidences of uræmia other than the vomiting and the suppression of urine.

In considering the case afterwards we still felt justified in attempting some relief to the patient, although we were unsuccessful. In the first place, she was losing large quantities of blood and was suffering both from her frequency of urination and from

cardiorenal and lung conditions. The increased length of time required to perform the operation under this anæsthesia, and the mental shock often accompanying it, are its chief disadvantages.

Spinal anæsthesia has a very limited use. I believe it to be a dangerous anæsthetic, even in the hands of the most expert, and certainly should be used cautiously in the aged and in cases of long duration.

Unless absolutely contra-indicated ether is certainly the anæsthetic of choice, and from the deaths recorded in this series, is not complicated by pneumonia or uræmia any more frequently than any of the other anæsthetics mentioned.

The operation performed must relieve the constriction, and if the gut is not gangrenous, return it to the abdominal cavity. If the gut is not viable, and that often is a very hard question to decide, one of the following procedures must be adopted.

If it is a border line condition and you are unable to decide whether the gut is gangrenous or not, it can be left in the wound for 12 to 24 hours until all doubt has passed.

If the gut shows a small gangrenous area we have been quite successful by invaginating this spot. If a large gangrenous area is encountered this portion of the gut must be resected and either a lateral or end-to-end anastomosis performed, the latter preferred, or an artificial anus can be established. Our statistics favor the resection method. In either instance the cases are most unfavorable and the mortality is very high.

One of the most remarkable recoveries in this series was in a woman, 50 years of age, with a hernia of the femoral variety involving the small intestine, which had been strangulated for four days. An artificial anus was established, which later healed spontaneously.

In strangulated hernias of the so-called Richter type, or partial enterocele, either femoral or inguinal, the mortality is high. This is probably due to the fact that these hernias are small, are often overlooked, and consequently come to the

FIG. 21.



X-ray picture of the kidney region in Case V. It is seen that the calculus occupies the pelvic outlet and there is one small extension in the calyx. The stone is seen well below the last rib and is, therefore, easily accessible and was removed by pyelolithotomy with primary union in the wound.

FIG. 22.



X-ray picture of kidney region in a case of renal calculus in which all the symptoms of intense renal colic were referred to the right kidney. The cystoscopic findings showed the left kidney to be affected and an X-ray picture showed the calculus occupying the pelvic outlet in the left kidney. The X-ray shows the stone low down well below the free border of the ribs and therefore easily accessible and removable by pyelolithotomy. This was done and patient made an uninterrupted recovery from the wound.

umbilical hernias, on account of the many and dense adhesions, it is often best to simply relieve the constriction. Especially is this true if the patient's condition does not warrant a prolonged operation.

In this series 32 cases died. The cause of death was as follows: Peritonitis, 11; uræmia, 3; pneumonia, 4; shock, 5; myocarditis, 2; delirium tremens, 2; apoplexy, 2; acute dilatation of heart, 1; volvulus, 1; sarcomatosis, 1. The five cases that died of shock were desperate ones and really should be classed under deaths due to peritonitis.

The prognosis depends almost entirely upon the degree and length of time the hernia has been strangulated and the resisting power of the patient.

The type of hernia, the sex and the age seems to have some bearing on the mortality. The death rate is lowest in children and highest in the aged. The mortality is higher in femoral than in inguinal and is highest in the umbilical.

The reduction of the mortality of strangulated hernia, as stated earlier in this paper, depends upon the education of the public and shall I say, profession, to the importance of early operation and the avoidance of prolonged and vigorous taxis.

The prevention of strangulated hernia is likewise an educational one. By educating the public to the danger of a simple hernia becoming strangulated, and the importance of having the hernia operated upon, or if operative treatment be refused, the wearing, under the supervision of a physician, a properly fitting truss will reduce the number of this almost inexcusable condition.

In closing, I wish to make a plea that all simple hernias in children, and especially those of the scrotal type, be operated upon. I believe it is wrong to order a truss for these cases, when we know the percentage of cures is very small. If a radical cure be performed in these cases, we have taken a great step toward the prevention of strangulated hernia.

CASE IV.—*Multiple calculi in right kidney, with pyonephrosis to a degree practically destroying the kidney; other kidney sound; nephrectomy.*

A young woman who had suffered from intermittent attacks of renal colic on the right side, at which times there would be fever, pain, and general prostration. History dates back to the birth of her child three years previously. The cystoscope showed large amount of pus coming from the right kidney. The left kidney was normal. When the right kidney was exposed it was found to be a mere shell containing numerous calculi. The indication in this case was for nephrectomy without question (Fig. 20).

CASE V.—*Single calculus in the pelvis of the right kidney; left kidney sound; calculus removed by pyelolithotomy.*

A woman about twenty-eight years of age. Four years ago was operated upon for supposed appendicitis on account of indefinite pains in the right side. The appendix was removed, but the trouble still persisted. One year ago urine showed a large amount of albumin during pregnancy. Some pus in the urine, which has never cleared up. She has had very considerable bladder irritability, with frequency of urination. Chief complaint now is bladder irritability with urine containing pus and blood. Pathological examination showed pure culture of Streptococcus albus. Bladder urine showed pus, oxalate of lime, and a few red blood-cells. Further questioning elicited the history that she has suffered from so-called attacks of indigestion which centre in the right side in the region of the right kidney.

Cystoscopic examination showed congestion of the bladder. Both ureter openings normal, with some congestion near the right ureter opening. Catheterized urine from the right kidney very profuse and watery, contained pus. Catheterized specimen from left kidney perfectly clear, very profuse. Both kidneys very excited.

X-ray examination showed a sheath-shaped calculus in the pelvis of the right kidney (Fig. 21). Its size and position on the X-ray plate showed that it was an ideal case for pyelolithotomy. The stone was removed at the Long Island College Hospital by pyelolithotomy. Patient made an uninterrupted recovery.

it may be assumed that the results obtained in this series of cases are not much better than might be expected at the hand of the average surgeon.

In surveying the literature I have given no consideration to the many papers describing minor modifications in the technic of applying the Whitehead principle nor to the numerous articles reporting one or two unfortunate results following attempts at the Whitehead operation. Whitehead<sup>1</sup> himself, in 1887, published a series of 300 cases which he had operated on by the circular method. Omitting particulars, he makes the simple statement that there were no deaths and no post-operative complications, such as hemorrhage, ulceration, abscess, stricture or incontinence. This paper was in the nature of a reply to critics and is less convincing than it might have been had the cases been reported in greater detail.

Yukelson<sup>2</sup> published a paper in Russian, the title of which translated is "Three Hundred and Thirteen Operations for Hemorrhoids by the Whitehead-Veresco Method." Unfortunately this article has not been accessible, and cannot be reviewed.

W. Graeme Anderson<sup>3</sup> in 1909, published a study of the after results of 300 hemorrhoid operations. Of these 150 were operated by the ligature, 100 by the Whitehead method, and 50 by the clamp and cautery.

By Anderson the Whitehead method was considered the most painful and the cautery the least painful; the catheter was necessary in 10 per cent. of the ligature cases, in 6 per cent. of the Whitehead cases, and in none of the clamp and cautery cases; the return of sphincter control was earliest after the cautery and latest after the Whitehead operation. There seemed to be a greater tendency to stricture after Whitehead operations than after the others, especially when the area healed by granulation was large. The statement is made that no Whitehead case healed by first intention; that skin tags were least often found after the Whitehead and most frequently after the use of the ligature. There were no recurrences within six weeks in any of the cases. Post-opera-

FIG. I.



Diverticulum of bladder. X-ray with collargol. Before excision.

were no deaths, nor are there any notes as to the occurrence of anaesthesia disturbances, such as pneumonia and bronchitis. The absence of pulmonary complications may be due, at least in part, to the position of the patient on the operating table (head low and high buttocks), which prevented the gravitation of mucus, etc., into the respiratory tract. In many of the cases there were pre-operative complications. Thus in eight there was fistula, three were neurasthenics, and three suffered with fissure, two had rectal ulcer, two hernia and two polypi; others suffered from amoebic dysentery, chronic prostatitis, enlarged prostate, pilonidal sinus, lues, severe secondary anaemia and urethritis.

Among the post-operative complications are the following: in one case a haematoma which became infected; in four cases post-operative hemorrhage; in six cases there was infection of the suture line which caused a local abscess; post-operative ischiorectal abscess was observed once; in two cases there was post-operative fecal impaction, and in one of these chloroform was required for its relief. In most cases a lead and opium pill containing 1 grain of opium was given three times a day, for the first three or four days. In addition to this most cases required one or two doses of morphia (gr. one-eighth) hypodermically. In a few cases much larger amounts were required—as much as 3 grains of morphia in one case which was complicated by an extensive infection. In not all instances was a note made as to the necessity for catheterization; but memoranda as follows were obtained: catheter not used, 36 cases; used once, 43 cases; used twice, 15 cases; used three times, 20 cases; used more than three times, 42 cases. In one case the patient had to be catheterized for twelve days after operation. As to the condition of the wound at the time of the patient's discharge from the hospital, it was noted that there was a granulating surface of greater or less extent in 116 cases. The average time of detention in the hospital after operation in the first years of this series was about fourteen days; this has been reduced to about ten days in the later years.

To obtain the subsequent history of the cases treated by

On admission the patient showed an undue pallor and a general lack of tone, probably due to the toxic absorption from his urinary tract. His physical examination showed no organic or nervous disturbance. The right testis was somewhat larger than the left, and there was a small nodule in the right epididymis.

There was slight tenderness in the right costovertebral angle. Cystoscopic examination showed just behind the right ureter meatus, which was normal though displaced toward the neck of the bladder, a large diverticular opening, into which the cystoscope entered readily. The interior of this cavity was easily inspected, and its mucosa found to be inflamed, and covered with pus, especially in the dependent parts. Just mesial to the orifice of the diverticulum and behind the interureteric line there were two small crypts, which just admitted a catheter, but from which no stream was emitted. The left ureter meatus was normal in appearance, and just behind it and a little to the left there was another small diverticulum, situated in the same relative position as the enormous one on the right side. The trigone was very much inflamed. No third ureter could be found. After careful washing, the ureters were catheterized and clear urine obtained from the left, but slightly turbid (pus) urine from the right. Indigo carmine was excreted in good concentration from both sides in 20 minutes.

From the foul smelling urine only colon bacilli were recovered. The residual urine varied from 20-26 ounces, and the bladder capacity was 42 ounces. When the bladder was well filled it extended up to the umbilicus, and the examining finger could detect the filled diverticulum spread out in the region of Douglas's pouch, more on the right side than on the left. X-ray pictures with collargol (see Figs. 1 and 2) showed a pouch alongside and cephalad to the bladder of about the same size as that organ and about 5-6 inches in diameter.

As treatment by irrigation did not effect any improvement, and as the right kidney already showed signs of disease due to pressure of the diverticulum on the corresponding ureter, it was decided to operate on the patient and effect, if possible, a radical cure. The fact that the mortality in these cases, if neglected, is very high influenced me in my decision.

*Operation.*—Transperitoneal excision of the diverticulum.

a narrow wire-like ring of fibrous tissue of wide calibre which easily admitted the index finger and caused no symptoms. In 14 cases a recurrence in some measure had taken place. One of these patients wrote that for 19 years he had had a perfect result, and then developed a thrombotic external pile. Another states that he had two small skin tags remaining from the operation. A third that he has a small external pile. Another merely says that there is still "some bleeding." Four others have what they describe as a "little return" of the piles. One patient, in response to letters, returned to the hospital, was re-admitted, and operated upon for an isolated hemorrhoidal polyp, which had developed since his original operation. In five cases there was more or less extensive recurrence of the hemorrhoids and of these, three were operated upon the second time. Upon one of the three a third operation was made, each of the operations being performed by a different surgeon and by a different method. This patient states that he still suffers from hemorrhoids.

*Conclusion.*—The Whitehead operation should not be considered a formidable procedure nor one which results "commonly in incontinence and stricture," as is frequently stated. It does not absolutely and forever preclude the return of varicosities, as some of its advocates claim that it does. A definite indication for its employment is the existence of a rosette or complete circle of varicosities. The simple cases presenting one or several isolated hemorrhoids may not require the Whitehead operation for their relief, but the minor procedures are not so thorough and seem less likely to result in a radical cure.

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- <sup>4</sup> Takaki: Lancet, 1910, i, 929.
- <sup>5</sup> O'Conor: Lancet, 1910, ii, 946.
- <sup>6</sup> Hadda: Archiv. f. Klin. Chir., 1913, vol. c, 1029.
- <sup>7</sup> Martin, Achille: Thesis, Paris.
- <sup>8</sup> Veron, Felix: Thesis, Paris.
- <sup>9</sup> Labaume, Joseph: Thesis, Paris.
- <sup>10</sup> McGlannan, A.: Old Dominion Journ. of Med. and Surg., 1911, xii.

The patient left the table in good condition. Very little blood had been lost, and no fluid had escaped from the bladder or the diverticulum into the operating field.

The patient made an uneventful recovery. The permanent catheter was removed on the tenth day and the patient voided spontaneously 6-10 ounces at a time. Two days later the tube into the retroperitoneal space was removed and this tract healed rapidly. Twenty-six days after operation patient was discharged cured.

The pathological examination shows an inflamed fibromuscular sac wall with a lining of epithelium of the transitional type. In most of the sections the epithelial lining is absent. (Dr. F. S. Mandelbaum.)

The patient continues well, without any symptoms referable to his bladder. His residual urine is 1.5-2 ounces.

*Remarks.*—The case just described in some detail represents a typical case of diverticulum of the bladder. If one may judge from the structure of its walls, it was a congenital pouch and this is all the more likely as there was no obstruction in the outflow channel to lead to a secondary or acquired diverticulum. As is quite usual in these cases the diverticulum gave no symptoms until it became infected and then despite local treatment the cystitis and diverticulitis continued uninfluenced. If we can place any reliance on the statistical data contained in the literature, this patient would have gone from bad to worse and his kidneys would have become seriously infected (*vide Englisch*, who says that the mortality in such cases is 83 per cent.). After repeated washings of the bladder the diverticulum was approached transperitoneally, so as to give the best view of the condition and to render it easiest to deal with any adhesion that might have developed. The approach was an excellent one, and the operation was much simpler than I had expected. After removing this large sac the equally large retroperitoneal space in which it had rested had to be dealt with, and as this area might very readily have been contaminated, I decided to drain this space by marsupialization, bringing the opening into this space out to the

An incision is carried down to the bone and the two fragments are manipulated into line. In a case of transverse fracture it will usually be possible to make the jagged ends engage. The fragments are held firmly in line by an assistant and with the circular saw a slot of sufficient length is cut in the long axis of the bone, care being taken that it is accurately at right angles to the surface. With the special saw it will be found that this is quite easy and that even in deep wounds the flaps do not seriously interfere, the guards on the saw pushing them out of the way. Immediately the slot has been cut the plate is inserted. Screw holes are drilled, the tapered ends of the screws are inserted and the screws are driven home. The taper enables the screw to support itself while the driver is applied. An occasional backward turn of the driver will clear the thread of the screw and enable it to cut more cleanly. If it is preferred, wires encircling the bone may be used instead of screws.

The chief advantage of this method is the great solidity of the fixation. In the case of a fracture of the femur it is quite practicable to get the patient out of bed on the next day should his condition demand it, and passive movements of the joints may in all cases be begun at once. Splints are quite unnecessary and in fact harmful as they tend to interfere with the efficient circulation which is so essential to repair. The girder form of the plate allows it to be made of thin material without impairing its strength. Only a small portion of the plate appears on the surface of the bone and the heads of the screws are rounded so as to fit snugly up against it. There is thus very little projection on the surface and no interference with muscular action. The existence of the plate inside the bone seems to give rise to no trouble. It is probable that in most cases the whole plate is soon buried in callus.

Though the method is not adapted to many forms of fracture it appears to meet admirably the requirements of the two for which it was specially designed, namely, transverse fractures of the femur and humerus about the middle of the

# REPORT OF 105 CASES OF STRANGULATED HERNIA.\*

BY EMORY G. ALEXANDER, M.D.,

OF PHILADELPHIA,

Associate Surgeon to the Episcopal Hospital.

THE 105 cases of strangulated inguinal, femoral, and umbilical hernia herewith reported were operated upon at the Episcopal Hospital within the past six years. Covering as it does quite a large number of cases, and the work of several years, an analysis of these cases, I thought, might prove of interest to the Academy.

It is strange that in the past two decades of progressive surgery, in an era unparalleled by the great strides made in the art of diagnosis, operative technic, and after-treatment, to say nothing of the help obtained by educating the public to surgical conditions, that little has been done, either directly or indirectly, to lower the death rate of this condition.

The onward march of surgery has been from the pelvis upward, until that great divide, the diaphragm, was reached. This obstruction has caused a momentary halt in the advancement of visceral surgery, although a few have crossed over and invaded the thoracic cavity. During this momentary lull in visceral surgery some few have turned back to the old things that were long considered a dead issue. We have but to recall to mind the magnificent work of Lane and Murphy on bones and joints to realize that this momentary pause has been a blessing in disguise. Let us hope that others will turn back to the "dead issue" and that strangulated hernia will be considered.

The mortality of strangulated hernia remains to-day what it was ten or even twenty years ago. It is, unrelieved, an acute progressive abdominal condition, and the mortality will

\* Read before the Philadelphia Academy of Surgery, May 5, 1913.  
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## STRANGULATED HERNIA.

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<i>Mortality</i>		
Inguinal Per cent.	Femoral Per cent.	Umbilical Per cent..
Right inguinal, male, 22	Right femoral, male 100	
Left inguinal, male, 24	Left femoral, male, 0	
Right inguinal, female, 50	Right femoral, female, 25	
Left inguinal, female, 50	Left femoral, female, 28	
Inguinal mortality:	Femoral mortality:	Umbilical mortality:
Male.....23	Male.....50	Male.....25
Female.....50	Female.....26	Female.....50
Total inguinal mortality:	Total femoral mortality:	Total umbilical mortal-
Male and female...26	Male and female...28	ity:
		Male and female .45
Total Mortality		
Male.....		24 per cent.
Female.....		38 per cent.
Male and female.....		30 per cent.

continue to remain unchanged until the profession and public, as in appendicitis, and as we are trying to do in cancer, become better educated to the fact that an early operation and the avoidance of taxis in hernias are the two most important factors in lessening the mortality.

Unfortunately, we cannot in strangulated hernia as in appendicitis with peritonitis, "dry dock our patient for repairs," and hope for an abeyance of the symptoms, and after localization of the inflammatory process, a successful operation and ultimate recovery of the patient.

Of the 105 cases of strangulated hernia, 58 were males and 47 were females. Sixty were inguinal, 25 femoral, and 20 umbilical. During this period of six years 848 cases of hernia of the above types were operated upon at the Episcopal Hospital. Three of this number were strangulated. Six cases of strangulated hernia were admitted to the hospital in a moribund condition and no operation was attempted.

The great majority of these cases of strangulated hernia gave the usual history of having had the hernia for years and of wearing an ill-fitting truss. The symptoms varied. Among the most constant were sharp pains at the hernial orifice, colicky pains, nausea and vomiting. So constant were the last three symptoms mentioned, paroxysmal pain, nausea and vomiting, that when not reported on the histories, I believed

## A FURTHER NOTE ON REDUCTION OF FRAGMENTS IN FRACTURES OF THE LONG BONES AT OPEN OPERATION.

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OF NEW YORK.

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Knickerbocker Hospitals.

SOME months ago I described a method for distracting the overlapping fragments of a fractured long bone by means of a turnbuckle placed between two Lowman clamps,<sup>1</sup> one on each fragment (Fig. 1). As the turnbuckle forces the clamps apart, the resistance of the soft parts increases. This resistance is chiefly noticeable on the side of the bone opposite to where the turnbuckle is applied. The tendency is for the fragments to kink (Fig. 1), and for the shafts of the Lowman clamps to diverge instead of remaining parallel. If the divergence is at all marked, the turnbuckle's jaws slip up the shafts and slide out of place. To prevent this occurrence it is necessary *a*, to place the turnbuckle as close down to the bone as possible; *b*, to keep the two clamps parallel to one another by means of an assistant's hand which grasps both milled heads of the Lowman clamps, one with the finger tips, the other with the hollow of the palm. At that time, I thought of using a second turnbuckle armed with hooks to accomplish this, but I chose manual rather than mechanical control because of the danger of using too great force with the latter method. However, the experience of W. H. Bishop, of New York, whose material has been much greater than my own, has shown that it was awkward and rather unsatisfactory for an assistant to control the clamps. During a difficult reduction of a fractured tibia he accordingly slipped the loop handle of one of the Lane bone retractors over the free ends of both

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<sup>1</sup> "Reduction of the Fragments in Fractures of the Long Bones,"  
ANNALS OF SURGERY, November, 1912, p. 769.

## STRANGULATED HERNIA.

overdone. It no doubt saves many from being operated upon, and in instances when surgical aid is unobtainable, is frequently a life-saving device. It, nevertheless, causes the death of many. Certainly, in a large percentage of the cases in this series, can the mortality be attributed to the delay caused by taxis.

Simple taxis, or taxis aided by an anæsthetic, morphine injection, local application, hot bath, elevation of the foot of the bed, etc., often prolongs for hours or days the question of operative interference. So important was the question of taxis, and so dangerous its use, that the old surgeons tried to place a limit of time, varying from a few minutes to two hours, during which it was safe to persist in its use. Coley does not think it wise to continue taxis for more than five minutes. The same author believes that taxis should never be attempted in those cases "in which the symptoms of strangulation have been exceedingly severe from the start," in those "in which strangulation has occurred in previously irreducible hernias," and in cases "in which 24 hours have elapsed after strangulation."

The preparation of the patient for operation should be the same as for the usual emergency case. If the patient is vomiting, and especially if the vomitus is fecal in character, the stomach should be washed out. It is believed that the washing out of the stomach of these cases lessens the chance of an aspiration pneumonia, especially if ether be the anæsthetic. In the condition of the patient, and the technic to be employed. The anæsthetic used depends largely upon the operator, In the above cases, ether, chloroform, local and spinal anæsthesia were used.

Ether, I believe, in the majority of instances, is the anæsthetic of choice, and if used, should be preceded, in the cases with fecal vomiting, by washing out the stomach. Chloroform has a very limited use, but occasionally can be used advantageously in cases with kidney or lung complications.

Local anæsthesia is of advantage in cases complicated by

An incision is carried down to the bone and the two fragments are manipulated into line. In a case of transverse fracture it will usually be possible to make the jagged ends engage. The fragments are held firmly in line by an assistant and with the circular saw a slot of sufficient length is cut in the long axis of the bone, care being taken that it is accurately at right angles to the surface. With the special saw it will be found that this is quite easy and that even in deep wounds the flaps do not seriously interfere, the guards on the saw pushing them out of the way. Immediately the slot has been cut the plate is inserted. Screw holes are drilled, the tapered ends of the screws are inserted and the screws are driven home. The taper enables the screw to support itself while the driver is applied. An occasional backward turn of the driver will clear the thread of the screw and enable it to cut more cleanly. If it is preferred, wires encircling the bone may be used instead of screws.

The chief advantage of this method is the great solidity of the fixation. In the case of a fracture of the femur it is quite practicable to get the patient out of bed on the next day should his condition demand it, and passive movements of the joints may in all cases be begun at once. Splints are quite unnecessary and in fact harmful as they tend to interfere with the efficient circulation which is so essential to repair. The girder form of the plate allows it to be made of thin material without impairing its strength. Only a small portion of the plate appears on the surface of the bone and the heads of the screws are rounded so as to fit snugly up against it. There is thus very little projection on the surface and no interference with muscular action. The existence of the plate inside the bone seems to give rise to no trouble. It is probable that in most cases the whole plate is soon buried in callus.

Though the method is not adapted to many forms of fracture it appears to meet admirably the requirements of the two for which it was specially designed, namely, transverse fractures of the femur and humerus about the middle of the

surgeon late. In this type, on three occasions, the hernia reduced itself while the patient was being anaesthetized. In the first case, a herniorrhaphy was performed without exploring the gut; the patient died in two days of a diffuse peritonitis and the autopsy showed a perforated gangrenous area the size of a penny. In the other two cases, at the time of operation, the gut was caught and pulled down into the wound, thus ascertaining the true condition of affairs.

The hernias that reduce themselves while the patient is taking an anaesthetic, especially if the strangulation is of several hours' duration, and the gastro-intestinal symptoms have been marked, should be operated upon, as the true condition of the gut should be ascertained. One of the umbilical hernias in this series reduced itself while the patient was being anaesthetized, no operation was performed. The patient died a day or so later and the autopsy showed a volvulus of the ascending colon.

In the majority of instances of strangulated hernia there is little doubt as to the viability or not of the intestine. In some cases, however, the decision would tax the judgment of the most expert. The best test for the viability of the intestine is the application of compresses wrung out in hot saline solution, although help can be obtained by noting the loss or not of the glossy appearance, whether the gut is dull and granular, whether its color is red, purple, black, grayish or mottled, and also if the gut is firm and elastic or soft, flabby and collapsible.

Kocher lays great stress on the pulsation of the vessels of the mesentery and bowel.

If resection is to be done the excision should go wide of the gangrenous area, especially is it important to do so to the proximal side and get beyond the distended and water-logged portion into healthy bowel.

In all cases operated upon the ideal operation is a herniotomy and herniorrhaphy. Unfortunately, this is not possible in some, as the physical condition of the patient may only warrant the relief of the constriction. In large scrotal and



## IMMEDIATE AND LATE RESULTS OF THE WHITEHEAD OPERATION FOR HEMORRHOIDS.

A REVIEW OF 470 CASES.

BY HARVEY B. STONE, M.D.,  
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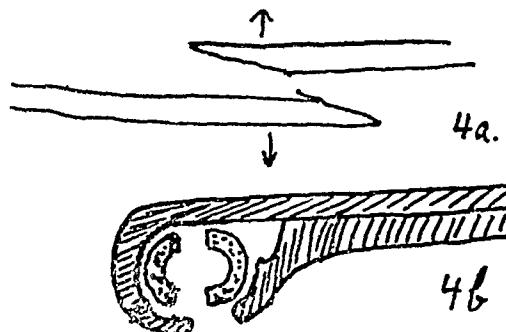
ALMOST since the description by Whitehead of the operation for hemorrhoids which bears his name, there has been animated controversy as to the merits and demerits of the procedure. Among the acquaintances of the writer there are many men, particularly rectal specialists, who highly disapprove of the Whitehead operation. On the other hand, many general surgeons of the highest attainments, whose opinion certainly should carry much weight, employ practically no other method in the treatment of piles, maintaining that if the operation be properly performed it is not likely to be followed by unfortunate consequences. The material accumulated at the Johns Hopkins Hospital afforded excellent opportunity to study the results of the Whitehead operation, as this has been the method of choice on the surgical service, since the hospital was opened, twenty-four years ago. With the kind permission of Dr. Halsted, the writer has undertaken to follow the subsequent history of the Johns Hopkins Hospital cases from 1889, when the work began, until 1910, when this review was undertaken. In addition to these cases, those operated on by Dr. J. M. T. Finney at the Union Protestant Infirmary have been investigated and included in this report. I wish to express to Dr. Halsted and to Dr. Finney my great appreciation of this privilege.

The unique feature of this article and the one which, perhaps, best justifies its publication, is the fact that the 470 Whitehead operations which are herein reported were performed by 45 surgeons, young internes for the most part, and some of them in the first year of their hospital service. Hence

just enough to maintain a proper parallel position of the Lowman clamps (Fig. 3a).

The six appended figures with their legends explain the mechanical conditions encountered and their method of con-

FIG. 4.



4a, during distraction frequently there is a tendency to lateral displacement. 4b, a third Lowman clamp, which embraces both fragments but is not tight enough to prevent distraction, readily controls this.

trol. I still recognize the ease with which too great force can be applied by this method. Distention should be gradual, not sudden; after a certain amount of resistance is met with, it is well to pause a minute or two and then proceed again.

tive hemorrhage occurred after ligation in four cases, after the Whitehead operation in two cases, and in no case after the cautery. Very few of these cases were observed for more than a year.

In 1910, Takaki<sup>4</sup> reported briefly 176 cases. There were three strictures, two ulcers, and one death (from pulmonary embolus) in this series, but no note is made as to how many of the cases were observed after operation, nor for what period of time. One instance of paralysis of the sphincter is also noted, but with the statement that this condition existed before operation and was not a consequence of it.

O'Conor,<sup>5</sup> in the same year, describing minor variations in the technic as practised in his clinic, incidentally records 490 cases successfully operated on by the Whitehead method, but with no specific details as to post-operative study of the patients.

While the present paper was being written, Hadda<sup>6</sup> published a paper dealing with the same subject his material embracing 223 cases, of which 127 were seen or heard from afterward, some of them after the lapse of 7 years. Among these patients there were three post-operative hemorrhages and one death, the latter attributed to scopolamine poisoning from idiosyncrasy. 155 cases required catheterization, and in 104 of these cases it was necessary beyond the first day. Of the 27 cases examined, three had small skin tags, one a small prolapse of mucosa, and one a small ulcer of the mucosa. Among the cases replying by letter, one complained of "weakness" and pain in the rectum, one of the persistence of a sigmoiditis antedating operation, and a third of slight stenosis. The others reported themselves as satisfied with the results obtained.

Besides these articles there are several dealing with a much smaller group of cases. Martin,<sup>7</sup> Veron,<sup>8</sup> Labaume,<sup>9</sup> and McGlannan<sup>10</sup> report series of from eleven to thirty-nine cases, all with good immediate results. But very few of the patients were observed for more than a few months.

I was rather surprised to find that in my collection there

# THE CHEVALIER JACKSON METHOD OF FINGER ELEVATION OF THE HYOID BONE IN GENERAL ANÆSTHESIA.

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WHEN the patient begins to lose consciousness in general anæsthesia, the tongue is prone to drop backward and obstruct the breathing. A very small amount of secretion then gives the impression that the patient is "full of ether mucus." Various tongue forceps, of more or less cruel design, and even a loop of suture material through the tongue, are used to draw the tongue forward. Bimanual upward traction at the mandibular angle is a well known and fairly satisfactory method of elevating the base of the tongue. By far the best method, however, and one which seems generally unknown, is to elevate the hyoid bone with the index finger introduced through the mouth and passed deeply posterior to the tongue, the motion being made as if to raise the entire head and neck with the *tip* of the finger, precisely as the hyoid bone and epiglottis are lifted with the Chevalier Jackson laryngeal speculum in direct laryngoscopy. In fact it was in Dr. Chevalier Jackson's clinic where it has been in use for years, that I was taught this finger method of elevating the hyoid bone to free the air passages. The method frees the breathing in a way that no amount of traction on the end of the tongue can accomplish. A patient who has been taking the ether badly, with cyanotic color, intense venous engorgement, in short the kind of patient who is generally known among anæsthetists as "a bad actor," will, immediately, upon using the hyoid bone elevation, take one great deep inspiration and thereafter will breathe so quietly that, unless the thoracic respiratory movements are noted, one is apt to think that

the Whitehead operation has been the chief purpose of this investigation. To secure data on this point a questionnaire was sent to each patient with specific interrogations, and a request for an examination if possible. As a result we have seen or heard from 185 cases. Of this number 31 have been operated on less than five years, 59 from five to ten years, 58 from ten to fifteen years and 37 from fifteen to twenty-two years. From the answers received and from examination of the cases, I conclude that the results were perfect in every respect in 134 cases, a percentage of 72.4. The most frequent complaint was disturbance of the sphincter action. This complaint was variously phrased; "weakness of control of the bowel" or "imperfect control" were common expressions, and in many cases the statement was made by the patient that he experienced inconvenience in this respect only when from medication or indiscretion in diet there resulted an attack of diarrhoea. There were 37 cases in which the muscular control was more or less impaired but in only one of these was there actual paralysis of the sphincter. It should be noted that this patient developed hemiplegia five years after his operation, hence it is not clear that the Whitehead operation was alone responsible for the paralysis of the sphincter. Of these 37 patients there were eight who complained of itching or moisture following the operation, but in most of them this was a temporary condition.

It will be seen that, except in the case of the hemiplegic, there was no instance of serious incontinence in the whole series. In this connection it should be remembered that where large prolapsing hemorrhoids have existed for years the sphincter is no doubt flaccid and weakened before operation.

A number of patients wrote that they had been bothered for five or six months by sensory disturbances. In 16 the itching and moisture is still complained of by the patient. In many instances the annoyance was said to be "slight."

In 5 cases there is a certain degree of stricture. Two of these were examined by the writer personally. One of them did not know that he had a stricture; in him there was found

# TRANSACTIONS OF THE NEW YORK SURGICAL SOCIETY.

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*Stated meeting, held at the New York Academy of Medicine,  
April 23, 1913.*

The President, DR. CHARLES L. GIESON, in the Chair.

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## CARDIOLYSIS.

DR. CHARLES N. DOWD presented a boy, nine years old, on whom he had done the operation of cardiolysis as an endeavor to mitigate his sufferings from an adherent pericardium. The boy had suffered from cardiac disability for five years, following rheumatism, of which he gave a history of repeated attacks, at one time being confined to bed for three months.

At the time of his admission to St. Mary's Hospital for Children, on October 25, 1912, his dyspnœa was excessive. He was unable to lie down nor could he take any exercise. He complained of precordial pain, and coughed after exertion or on reclining. Both physical examination and radiographic findings indicated an enormous cardiac enlargement. The right border of the heart was to the right of the sternum, and its left border was at the anterior axillary line. The apex beat was in the fifth intercostal space, three and a half inches to the left of the median line. There was a loud, rough systolic murmur at the apex, which was transmitted to the left. The pulmonic second sound was accentuated. The extremities were oedematous.

After careful hospital treatment for two months the boy showed slight improvement, but upon returning home his symptoms quickly recurred, and he was readmitted to the hospital.

Operation, January 31, 1913: About two and a half inches were taken from the anterior ends of the left third, fourth, fifth and sixth ribs and their cartilages, leaving a little of the posterior periosteum, as recommended by Fritz Koenig, but clearing it very

# A METHOD FOR THE MECHANICAL FIXATION OF TRANSVERSE FRACTURES.

BY H. S. SOUTTAR, F.R.C.S.,

OF LONDON.

Assistant Surgeon, West London Hospital; Surgical Registrar, London Hospital.

THIS method has been devised with a view to obtaining a more accurate and substantial fixation in transverse fractures of the femur and humerus especially, than has hitherto been possible. The plate used is of thin sheet steel and instead of lying upon the surface of the bone is for the most part buried in its substance. For this purpose a slot is cut longitudinally in the two fragments of the bone with a small circular saw.

The plate is 1 cm. or more wide and from 5 to 10 cm. in length. The whole of this portion is intended to be buried in the bone. A narrow flange projects from one edge and is to lie on the surface of the bone. This flange may be provided with holes for screws. In other cases it may be preferred to fix it with wires encircling the bone.

The saw is 4 cm. in diameter and is provided with a substantial handle and a guard. It can be boiled entire, it can be readily taken apart, and it can be adapted to any form of motor. The teeth are so constructed that they do not tend to catch in the bone though they cut with great freedom. The appliance is extremely easy and safe to use.

In most cases screws will be preferred and a special form of screw is provided. They are of steel with a fine thread, as they are intended to engage only in the compact bone. The point is slightly tapered and this portion of the screw is flattened on one side. A sharp edge is thus left by means of which the thread actually cuts its way into the dense bone. The screw may thus be driven into the bone with great freedom and scarcely any resistance is encountered till it is actually home. A solid hold is thus obtained which is impossible with other types.

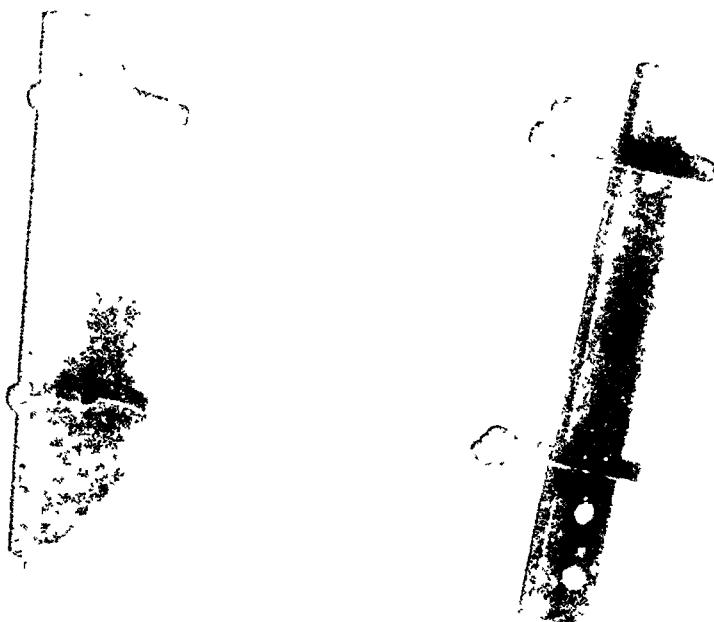
that at the same time it was the safest procedure. Because of the uncertainty of its result, however, and the poor condition of the patient, the simplest method was employed. A heavy catgut suture was passed around the pylorus and tied so as to close its lumen, but not crush the tissues. A number of linen Lambert sutures were inserted, approximately the tissues across this groove; these were placed on the anterior surface and as far posteriorly as possible. Vomiting occurred for four days after this operation and then ceased. Since then the patient had remained perfectly well; she had gained considerable weight and strength, and could eat any kind of food.

CASE II. *Gastro-enterostomy with Occlusion of Pylorus by Ligature-suture Method for Duodenal Ulcer.*—Dr. Pool said that even before the above described experience he had felt that an effort should be made to avoid producing a gastro-enterostomy if the pylorus was left open or was likely to re-open. In his second case this error was avoided by closing the pylorus in the same manner as above. This patient had rather acute and severe symptoms indicating an ulcer, and upon operation, a small, indurated ulcer was found on the anterior surface of the first portion of the duodenum. The pyloric opening was quite large. The pylorus was closed as in the first case and a posterior gastro-jejunostomy performed. This operation was done ten weeks ago and the result thus far had been perfectly satisfactory.

While this method was not a new procedure it was used in these cases in a somewhat modified form after a suggestion made to him by Dr. Martin. The permanency of this method of closing the pylorus was still doubtful. Of course, as experience had shown, such an accessory to a gastro-enterostomy was often unnecessary as is shown in the next case.

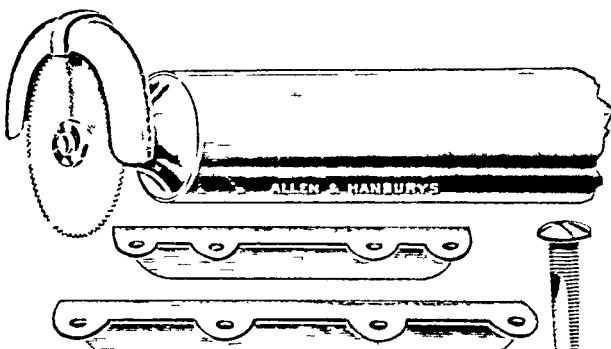
CASE III. *Benign Stenosis of Pylorus following Subphrenic Abscess Due to Perforated Duodenal Ulcer.*—In this case there was a firm, cicatricial, contracted pylorus, which suggested little likelihood of dilatation. The patient had been operated on in February, 1912, by Dr. Charles H. Peck, for a large subphrenic abscess, the incision being made along the free border of the right costal arch. The patient stated that after this wound had completely healed, in April, 1912, he began to have pain in the epigastric region, with vomiting once or twice daily. The vomitus consisted of food and mucus; he had never noticed any blood.

FIG. 1.



Plates applied to femur.

FIG. 2.



SCALE  $\frac{1}{2}$  SCREW FULL SIZR.

Soultar's saw and plates.

the patency of the pylorus had been re-established, and a large mass involving, apparently, the stomach, duodenum and transverse colon was made out. This was feared to be malignant, but as a peptic ulcer could not be excluded, the speaker said he advised Dr. A. A. Berg, after some consideration, to do a jejunostomy, after which the patient's condition immediately began to improve, doing so well, in fact, that the suspicion of carcinoma was practically discarded while that of a peptic ulcer was rendered more probable.

At the last meeting of the Society, Dr. Gerster said, Dr. Lilenthal presented a case where a Finney operation was done, in 1908, for a benign stenosis of the pylorus. The symptoms recurred, and four years after the primary operation, when the abdomen was re-opened, the stoma made by pyloroplasty had shrunken to such an extent, that it was scarcely possible to insert the end of a probe. To-night, Dr. Pool showed a somewhat similar case, which simply went to show that the Finney operation did not possess a very decided advantage over the ordinary pyloroplasty, and he wished to emphasize what he has said at the last meeting, namely, that this operation did not do away with the vicious tendency to hyperacidity which gave rise to the ulcers.

At a recent meeting of the Deutsche Gesellschaft in Berlin, the question of whether or not to exclude or tie off the pyloric end of the stomach gave rise to a very lengthy and interesting discussion. Some were strongly in favor of this procedure, notably von Eiselsberg, who advocated complete division of the stomach, while others, more especially Koch, said that they never practised exclusion of the stomach, and their results seemed to be better than by any other method. No satisfactory conclusion could be arrived at, however, and the matter was left undecided.

DR. POOL said that in his fourth case, to which Dr. Gerster had referred, he had no reason to believe that the Finney pyloroplasty had contracted, but what he wished to emphasize was that the recurrence of the characteristic pain was suggestive of the development of another ulcer in the duodenum.

#### FRACTURE-DISLOCATION OF THE SHOULDER.

DR. WILLIAM DARRACH presented a woman, forty-six years old, who on January 24, 1911, fell with her arm behind her back, striking on her shoulder. A month later she came to the Out-

shaft. The value of a method which ensures immediate and absolute fixation and which dispenses entirely with splints in these important and somewhat difficult cases will probably be appreciated.

The accompanying plates (Figs. 1 and 2) show the saw, screws and plate, and the method as applied to the femur of a boy of twelve years whose fracture had failed to unite by the ordinary methods. The operation in this case was carried out by Mr. Milne, of the London Hospital. The boy walked at the end of three weeks and when seen two months after the operation presented a result functionally perfect.

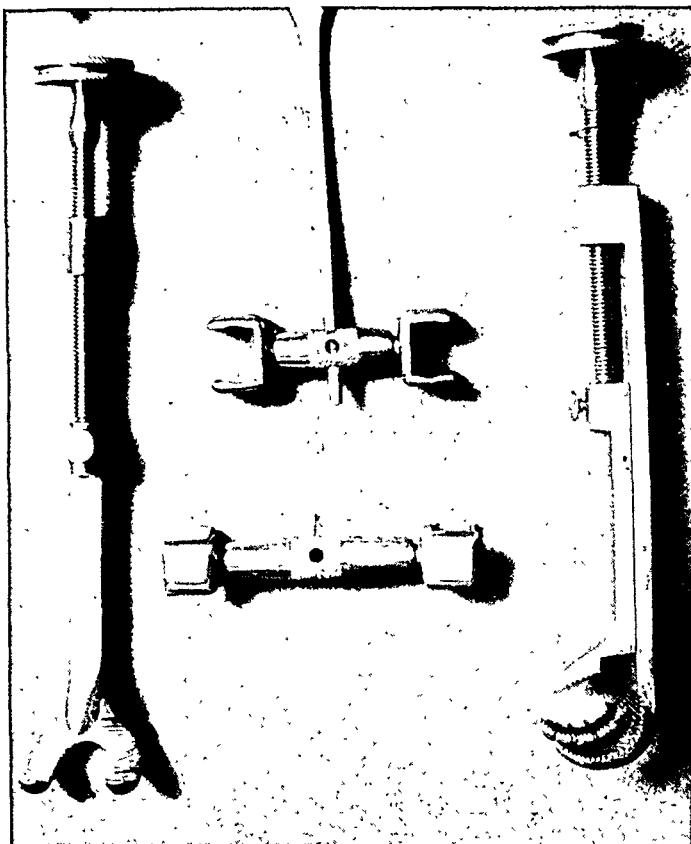
The plates, screws and saw have been made to my designs by Messrs. Allen & Hanburys from whom they may be obtained.

10 degrees of active abduction, and the supraspinatus could be felt contracting during this act. With passive abduction there was 90 degrees of active rotation. The patient was unable to fix her hair unless she leaned over. She was able to fasten her waistband in the back, and do washing and ironing, but was unable to scrub floors. There had been no evidence of osteomyelitis or arthritis.

#### FRACTURE OF THE RADIUS: LOWER SHAFT.

DR. DARRACH presented a man, thirty-eight years old, who five days before his admission to the hospital fell fifteen feet, fracturing his left lower radius. After several unsuccessful attempts at closed reduction, an operation was done on February 22, 1913. The upper end of the lower fragment was found anterior and to the ulnar side, a fragment of muscle being interposed between the broken ends. There was 90 degrees of rotary deformity. A 4-screw vanadium steel plate was applied, and the wound closed tight. The operation was of longer duration than usual, owing to a number of technical difficulties, but the most careful Lane technic was observed throughout. The patient's temperature rose to 102.2° on the second and third days; then it became normal and remained so until the tenth day, when it again rose to 102°. The wound was not dressed until the following day, when the stitches were removed, and owing to slight redness and puffiness the skin edges were separated and at least three ounces of creamy pus were evacuated from the deeper space. There was no odor to the pus, and remarkably little swelling of the forearm. A culture taken from the pus was negative. The wound was opened widely and packed with formalin gauze. It drained freely for a few days and healed at the end of twenty-four days. Twenty-one days later the scar was excised and the plate removed, all four screws still holding firmly without any signs of exudate. The bone under the plate was smooth and shining, with no evidence of repair on that side of the bone. The rest of the circumference of the bone was not disturbed. The wound was closed without attempting to remove the blood, hoping that the clot would hasten repair. The stitches were removed on the eleventh day, with firm union and without redness. Fourteen days after the second operation a blister appeared, which was opened and about half a drachm

FIG. 5.



Anterior and lateral view of modified Lowman clamps. Smaller turnbuckle with key in place. Range of smaller turnbuckle is from  $1\frac{1}{8}$  to  $2\frac{1}{2}$  inches; range of larger turnbuckle is from  $2\frac{3}{8}$  to  $3\frac{1}{2}$  inches.

Dr. Darrach said that of his series of 144 cases of open operation for fractures and dislocations, infection had followed in five, which included the compound case reported to-night. Two of these infections had occurred before they had adopted the Lane technic, which they now try to carry out in all cases. In one case of infection occurring since then, it could be traced to a break in the technic. In two later cases no cause for the infection could be found. The number of cases of infection given above did not include three cases where chromic gut was discharged at a late period, nor two cases where phosphor bronze wires were removed, as they were threatening the skin.

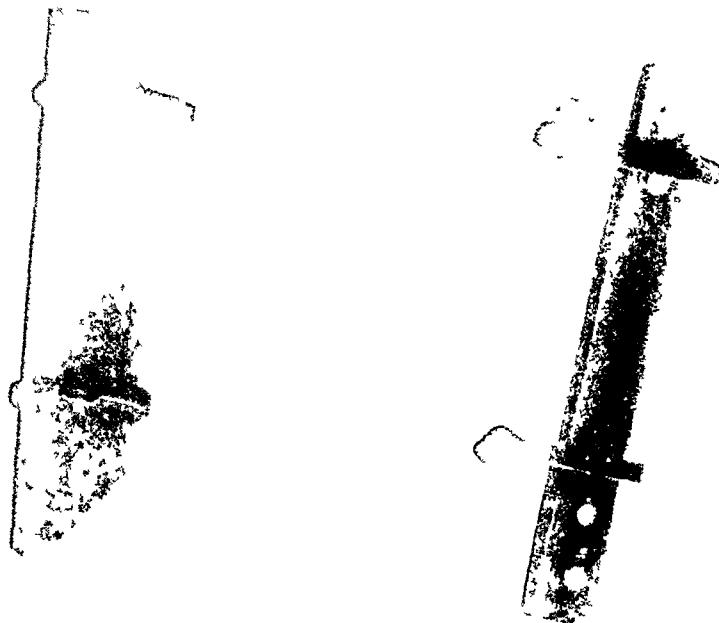
DR. GERSTER said he was glad to see the cases shown by Dr. Darrach, as they served to illustrate the fact that the open method of treating fractures with a plate or pin or otherwise, which had recently become so popular among surgeons, was by no means a simple procedure and in many instances might result in injury or even loss of life. At the Mt. Sinai Hospital, where fracture cases were comparatively rarely admitted, about 25 cases had been treated by the open method, and Dr. Gerster then reported in detail one case of fracture of the radius in a young man, apparently in perfect health, where, in spite of every possible aseptic precaution, the open method of reduction was followed by rapid and fatal sepsis.

ENDARTERITIS OBLITERANS RELIEVED OF SYMPTOMS AND  
FUNCTION BECOMING RESTORED IN CONJUNCTION  
WITH THE USE OF THE SCHNEE FOUR-CELL  
ELECTRIC BATH.

DR. WILLIAM C. LUSK presented a case of endarteritis obliterans, the history of which was as follows:

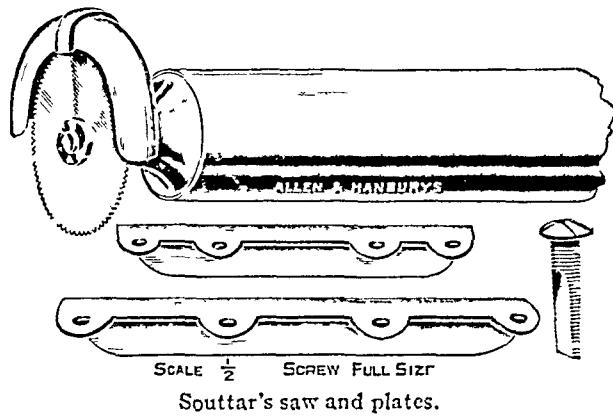
Male, age thirty-five. Onset of present disease early in 1901. For the previous 9 years he had worked as a carriage trimmer and operated a heavy sewing machine with his feet. The first symptom was a cramp in his left calf, coming on during walking. The cramp increased in frequency until at the end of 6 months he could walk only about one block. At this time he began to have a burning pain over the dorsum, and in the toes, of the left foot, especially in the big toe, which stopped his walking. The big toe got blue. The big toe-nail was removed for "ingrowing toe-nail" without relief. He was treated in a hospital with wet carbolic

FIG. 1.



Plates applied to femur.

FIG. 2.



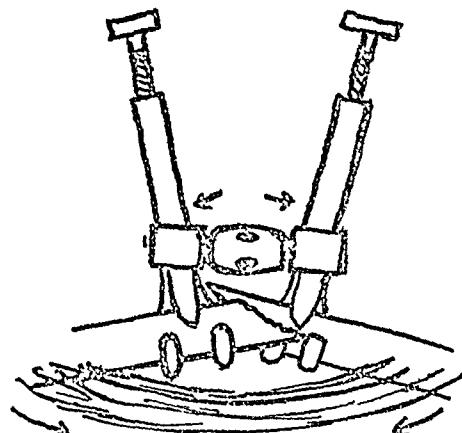
and outer portion of the sole of the foot, which sites were always those of the greatest pain. There was also the "burning pain" in the great toe and in a small area on the dorsum of the foot at the bases of the first four toes, and in another area in front of the outer portion of the ankle-joint. The foot became cyanotic, at least in the painful areas, when it hung down. The small ulcer resulting from the loss of the little toe-nail in December, 1911, still existed. It did not lead to bone. Finally on November 10, 1912, treatment with the Schnee<sup>1</sup> four-cell electrical bath was instituted. This bath (Fig. 1) consists of four porcelain tubs filled with water, in which the extremities are immersed, the water being electrified through the medium of carbon or metal electrodes, those of the foot tubs being connected to the positive pole while those of the arm tubs are connected with the negative pole. This treatment was known to cause an erythema of the skin of the submerged portions of the extremities during the passage of the current, and its continued use was reputed to produce a gradual improvement in the circulation of the extremities, so that it was deemed worthy of a trial. The current was taken from a fixture through a rheostat.

The patient had had to date (April 23) 156 of the electrical baths, which treatment had been attended with a variety of effects. The current at the beginning was used at 20 ma. but in two or three days was established at 30 ma. for 10 minutes. During the first month the improvement was marked and the patient became practically free from pain. On December 9, however, he had a sudden return of the "freezing pain" in and around the right little toe, which attack lasted about 12 hours. At the same time a "drawing pain" developed at the inner side of his leg, which he had had at a previous time. After this the pain would come on in attacks alternating with periods of intermission. At this time the pain would always be arrested or eased for a number of hours consequent upon taking the bath. Thus on December 14, 1912, after a bath at 1.30 P.M., the pain was eased until midnight. On December 15, 1912, the bath was omitted and his pain the following night he described as "awful." Immediately after his bath on December 16 the pain all left and that night he slept 8 hours. Later, however, at a time when the skin seemed to have

<sup>1</sup> A. Schnee: Das elektrische vier-zellen Bad. Medicinische Blätter, xxx, 1907, p. 519.

Lowman clamps and blocked up the free space left at one end until the clamps were parallel. As the turnbuckle forced the clamps apart, one block after the other was removed. Reduc-

FIG. 1.



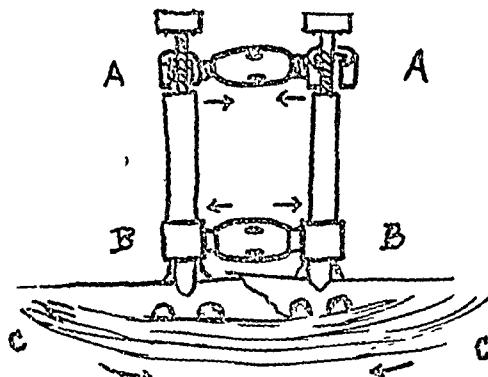
Showing tendency for distal ends of Lowman clamps to diverge because of resistance by soft parts.

FIG. 2.



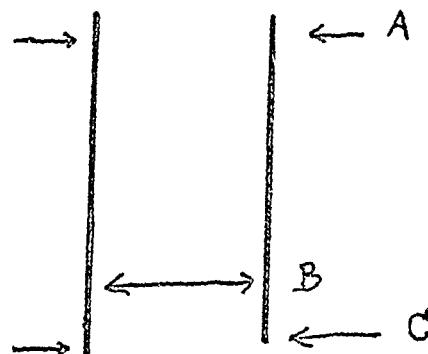
Turnbuckle armed with hooks.

FIG. 3a.



Divergence controlled by hooked turnbuckle at AA. Arrows indicate lines of force. Usually it is more convenient to apply turnbuckle at BB, maximally contracted, and to apply hooked turnbuckle at AA, expanded sufficiently to engage diverging shafts. Then this same turnbuckle at AA is contracted until clamps are parallel or nearly so, after this expansion of turnbuckle at BB can begin.

FIG. 3b.



The Lowman clamps constitute levers; the turnbuckle at B is the fulcrum, the resisting soft parts at C and the turnbuckle at A balance each other.

tion was easy, and control was much more certain than by the assistant's hand. This crude make-shift was so satisfactory, that a turnbuckle was made, armed with hooks (Fig. 2) to keep the clamps parallel. As the turnbuckle close to the bone forces the clamps apart, the upper turnbuckle is released



A DEVELOPMENT OF THE AUTHOR'S GASTRO-  
ENTEROSTOMY CLAMP.  
BY WILLARD BARTLETT, A.M., M.D.,  
OF ST. LOUIS, MO.

IN the ANNALS OF SURGERY for November, 1912, appeared Dr. Buchanan's article entitled "A Modification of Bartlett's Gastro-enterostomy Clamp." His most excellent suggestion referred to an instrument which I presented in the ANNALS of August, 1911.

The contrivance referred to produces uniform pressure at every point, the amount being directly determined by the fingers applying the instrument.

The accompanying illustration shows how the original idea has been developed and the contrivance improved. The two outside blades are now made so wide that the viscera and packs are held out of the operator's way, while at the same time the likelihood of soiling is greatly lessened. This later instrument is much easier to apply than was its predecessor. Now one has merely to compress the stomach between the fixed outside blade and the middle blade, which can be locked in position by the thumb screws underneath. In like manner the jejunum is fixed separately between the middle blade and the floating broad blade. All is now ready for the suture.

To remove the instrument, merely unfasten the four thumb screws underneath and withdraw the fixed broad blade. This allows the other two blades to fall apart and be taken out separately.

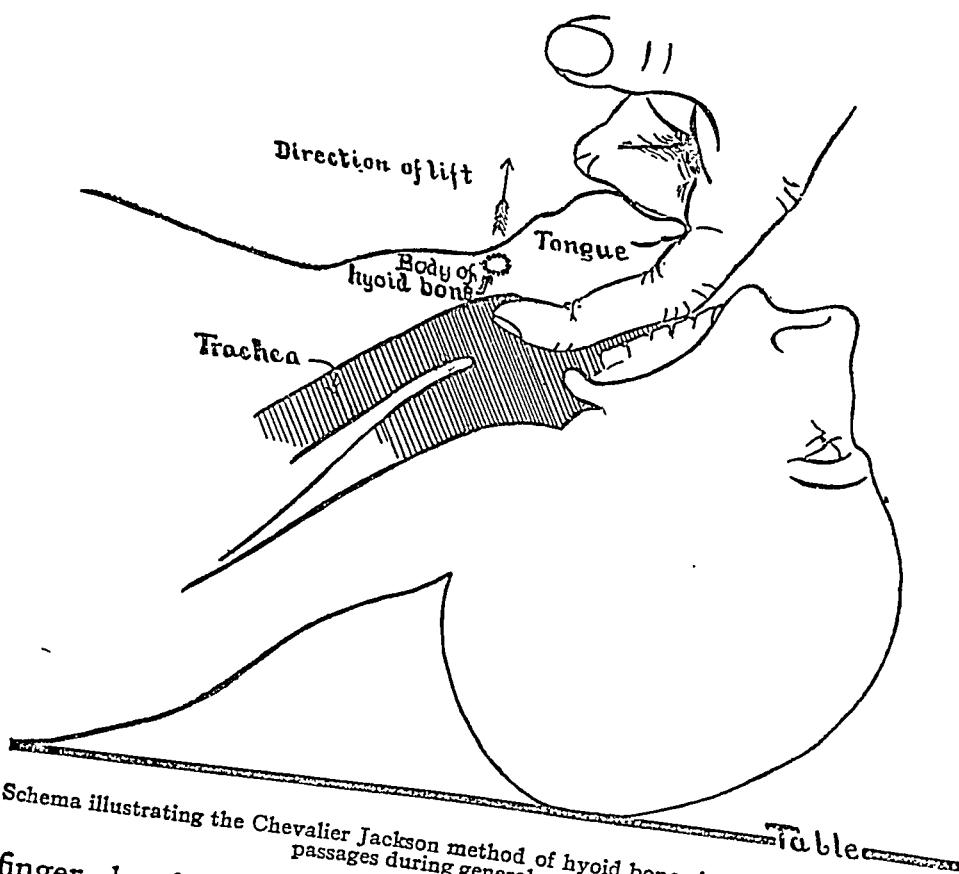
On February 26 a test was made with the bath to see how long a current of 15 ma. could be used before it would excite pain. The pain came on with this strength of current in 13 minutes, at the expiration of which time the bath was discontinued. The pain after this bath lasted only  $\frac{1}{2}$  hour and the patient was then comfortable for the rest of the day and slept all of the following night. The baths were then given, using a current of 15 ma. for 15 minutes, with which treatment the attacks of pain were less severe, but they still excited some discomfort so that on March 1 the current was further reduced to 10 ma. and the time to 10 minutes. From this time on improvement progressed unabatedly and rapidly. The attacks of pain became shorter and less severe and the intervals longer. On March 6 the pain after walking lasted only 15 to 20 minutes and was not very severe. Then during a cold snap the pain increased. The patient had his last severe attack of pain on March 15, which lasted 3 hours, after which the attacks of pain became hardly noticeable and then excepting for a very slight attack of pain on April 10, disappeared entirely the latter part of March. About April 1 the patient gave up the use of his cane. The administration of mixed treatment in conjunction with the baths was studiously limited, it having been allowed only for one day, the end of February, and again for not more than a week, early in March.

At the present date, the foot is no longer cold; the ulcer of the little toe has healed all but for a small opening which just admits the extremity of a probe; (the variations in the color of the toes had not at this time been noted; cyanosis affected most noticeably the dorsum of the little toe); the muscles of the leg have been developing; the patient walks short distances quite easily though a little stiffly. This stiffness in gait, together with a slight soreness around the ankle-joint during locomotion, seem to be only accompaniments of the bringing into use again of long disused parts. The ankle-joint itself has complete normal mobility. Since February 11, the patient has gained 7 lb. in weight.

NOTE.—May 14, 1913. The baths, using 10 ma. for 10 minutes have been continued. The soreness on locomotion is nearly all gone and the patient walks more easily. For two weeks preceding May 9 the patient had been sleeping 9 to 10 hours every night. Since May 5 the patient has been troubled with a burning sensation, for the most part momentary in duration and coming on

breathing has ceased altogether. The color will clear up and the breathing will thereafter be free if the patient's head be maintained in the forced extension, direct laryngoscopy position (Fig. 1), with the head flat on the table. In this position, the neck is thrown upward and the hyoid bone is maintained in an elevated position once it has been elevated with the

FIG. 1.



Schema illustrating the Chevalier Jackson method of hyoid bone elevation to free the air passages during general anaesthesia.

finger, by forcing the patient's forehead downward toward his feet. If desired, of course, the finger could be kept in place while the administration of the anaesthetic is continued by wrapping with towels, but this is unnecessary, if the position is correct. If the patient is only very slightly anaesthetized, retching may be caused by the presence of the finger, but the ether can be pushed as soon as a free air passage is restored. Some sort of bite block or gag must be used to prevent the finger being bitten, but wide gagging defeats the

returned to his work, which was that of a motorman, on a trolley car, 5 weeks later, in which occupation he had been actively employed since, using the hand break of the trolley most of the time. The abdominal wound was at the present time solid.

Dr. Lusk said he had for a good many years practised entering the rectus sheath in front through the portion internal to the conjoined tendon after first raising therefrom the overlying aponeurosis of the external oblique. To enter the rectus sheath from behind working beneath the muscles, had always seemed to him to be an awkward procedure, and, in the presence of an intact transversalis fascia in the floor of the inguinal canal, inadvisable.

He said that formerly he had used a low vertical opening in the front of the rectus sheath beneath the aponeurosis of the external oblique, extending down to the pubic crest, with which technic the rectus was usually drawn out laterally under some restraint. Recently he had added to the vertical cut at its upper extremity, a transverse cut, dividing the sheath out to its outer edge, which step in the technic he wished to call especial attention to. By cutting the flap in this way in the shape of a right-angled triangle, the sheath was laid open out to its outer edge so that the rectus muscle could be liberated from its intramural attachments under guidance of the eye, and its lateral displacement was no longer restricted by the sheath. Another advantage of this anterior triangular flap method he said was, that the sewing of the everted flap to Poupart's ligament interposed another layer to replace the deficient conjoined tendon. This line of union should be effected by a separate row of stitches. It was easier to make the transverse cut first and follow it with the vertical one. The sutures in the flap made from the sheath should catch Poupart's ligation near its deep border which was more or less rigidly held, while those in the rectus muscle should catch Poupart's ligament through its more superficial fibres, which had some mobility and would therefore be drawn upward to meet the rectus partway as the sutures were tied. In the repair the aponeurosis of the external oblique directly overlay all that portion of the transplanted rectus which was situated above the level of the transplanted cord, thus in large part supporting the area in the front of the rectus sheath from which the triangular flap had been cut.

As regarded the surgical anatomy, Dr. Lusk said that the outer

thoroughly, as suggested by McEwen. After this hard portion of the chest wall was removed, the remaining portion moved very freely with the cardiac pulsations.

The boy's convalescence was interrupted by an attack of bronchopneumonia, but at the present time, nearly three months after the operation, he is slightly better than he was before he had been operated on. The mechanical procedure in this case, Dr. Dowd said, was easy. The result, up to this time, was neither very encouraging nor very discouraging, and it indicated that further trials might well be made in properly selected cases.

#### FOUR GASTRIC AND DUODENAL CASES BEARING ON THE QUESTION OF AN OPEN PYLORUS AFTER GASTRO- ENTEROSTOMY.

DR. EUGENE H. POOL presented the following patients: CASE I. *Persistent Vicious Circle.*—The first case of the series was shown to illustrate the possible ill-effects resulting from the coexistence of a wide-open pylorus and a gastrojejunostomy. Closure of the pylorus in this case effected a cure, showing that the symptoms—persistent vomiting and emaciation—were due in this case to the open pylorus.

The patient was a Sister of Charity, thirty-two years old, who was operated on in another city six months before she came to the French Hospital. The operation had been done for the relief of gastric symptoms of about six months' duration, consisting of severe attacks of pain usually coming on from fifteen minutes to half an hour after meals, and vomiting; the vomitus often containing blood. The particulars of this operation could not be learned, but the patient stated she was told that an ulcer was found. Directly after the operation she said she began to vomit, at first mucus and gastric juice; later bile-stained fluid. Gradually this symptom became more aggravated until she vomited almost continuously, often several basinsful daily. She seldom could retain food, sometimes being able to keep down a few ounces of peptonized milk, but nothing solid. This continued for six months, and she became much weakened and emaciated.

Operation revealed a large gastro-enterostomy opening and a normal pyloric opening. There were no apparent kinks or adhesions, nor any lesion in the stomach or duodenum. It was decided that closure of the pylorus was likely to relieve the symptoms, and



This condition continued for perhaps six months, when he began to vomit after each meal. He could practically retain no food, and became much emaciated and weakened.

Operation, February, 1913, revealed a hard, cicatricial area involving the first portion of the duodenum, which was imbedded in dense adhesions. A gastro-enterostomy was done, with entire relief of symptoms.

CASE IV.: *Excision of Duodenal Ulcer with Pyloroplasty.*—In the last case shown by Dr. Pool, a young man who was operated on in July, 1912, it was decided to do a pyloroplasty with excision of the duodenal ulcer in preference to a gastro-enterostomy, the normal anatomical conditions thus being more nearly preserved, two outlets from the stomach being avoided and the stomach being adequately drained. This procedure was planned to meet the surgical indications in a certain type of duodenal ulcer. Its aim was the excision of the ulcer, with enlargement of the lumen of the pylorus. It was thought that for the reasons already enumerated it might be employed advantageously in dealing with certain small ulcers on the anterior wall of the duodenum near the angle of approximation in a Finney operation. Its trial in this case had proven only partially satisfactory, and Dr. Pool said he would hesitate to resort to the procedure again on account of the likelihood of the etiological factor, which had given rise to the first ulcer, continuing to act and resulting in the development of further ulcers. The patient did well for a time, but for several months past he had suffered from considerable pain in the epigastrium several hours after eating. This pain was relieved by taking a cup of tea or hot water. His general condition, however, had improved greatly; he was now able to eat anything and was not subject to belching and vomiting as he was prior to the operation. His symptoms, however, suggested the development of another ulcer.

DR. ARPAD G. GERSTER said he had under his observation at present a patient upon whom a gastro-enterostomy was done for an ulcer in the vicinity of the duodenum. The posterior operation was done, and the antrum pylori was constricted. That patient improved very much after the operation, but returned six months later complaining of his former symptoms, and upon examination, a palpable tumor was made out. When the abdomen was reopened it was found that in spite of the presence of the ligature,

large number of cases, without having seen a single recurrence thus far.

DR. A. V. MOSCHCOWITZ said that in spite of the employment of so-called radical methods for the cure of hernia, recurrences were occasionally seen even in the hands of the best of operators. The speaker said he had been watching very carefully for the cause of such recurrences, and he had come to the conclusion that they were not due to failure to transplant the rectus. His investigations had shown that by the time the recurrence took place, the question of whether the original operation was a Bassini or a Coley or a Halsted had lost its import—it was something entirely different. In most of the cases where a recurrence had taken place he had found that the conjoined tendon or united internal oblique and transversalis had become entirely separated from Poupart's ligament, and that the fault manifestly lay with the suture material.

Dr. Moschcowitz said that three or four years ago, before a meeting of the Surgical Section of the N. Y. Academy of Medicine, he made the statement that the choice of a suture material in these cases made little difference. Since then he had changed his views on that point, and he now believed that an absorbable suture material in these cases became absorbed before the muscles had time to properly unite with Poupart's ligament. Personally, he was now doing all operations for the cure of hernia with silk or Pagenstecher sutures, and his results were much more satisfactory than formerly.

DR. ROBERT H. M. DAWBARN said that while he agreed with Dr. Moschcowitz that the cause of the recurrences in these cases was the separation of the conjoined tendon from Poupart's ligament, he did not believe that the explanation for the separation lay in the use of a non-absorbable suture material. Even in the description of Bassini's original technic—which the speaker said he had recently reviewed—nothing was mentioned of the extreme importance of loosening the conjoined muscle, both as to its superficial and deep surfaces so that there would be an entire absence of tension. In his own work, Dr. Dawbarn said, he made it a rule to strip the conjoined muscle until it practically rested down against Poupart's ligament without any tension. In surgery, as in matrimony, an unwilling union was apt to be followed by divorce.

More than twenty years ago, the speaker said, Dr. Willy Meyer

Patient Department with signs of a dislocation of the shoulder, which were verified by the X-ray. There was at this time complete deltoid paralysis, with anæsthesia over the region of the circumflex.

Reduction under anæsthesia having failed, an open operation was done 35 days after the injury, when it was found that the muscular attachments had been torn from both tuberosities, and the head of the humerus had been dislocated to the subcoracoid position. A shell of bone, with the subscapularis attached, lay against the glenoid, preventing reduction. When this was pulled aside, the head seemed to enter the glenoid cavity, and after suturing the lesser tuberosity in place, the wound was closed. Primary union resulted, but the X-ray showed that the head was still out of the glenoid. The wound was re-opened three weeks later, when it was found that the muscles had also been torn from the greater tuberosity, taking some of the bone with them, and that the head of the bone had originally been forced through this upper rent in the capsule. In the previous reduction the head had been forced through the opening made by the tearing off of the lesser tuberosity, so that the long head of the biceps and a strip of capsule were wrapped around the neck. These were unwound, and the head made to enter the proper opening. The subscapularis was again sutured to the lesser tuberosity, and an attempt made to bring the spinati to their normal attachment with chromic gut. The wound was closed, and the arm put up in abduction.

The operation was very difficult and prolonged, and the gloved finger was introduced several times into the wound. The temperature reached  $101.4^{\circ}$  on the second and third days; then fell to normal and remained so. The wound was dressed on the eighth day, when half a drachm of thick, yellow pus came from the region of the pectoral muscles. This drained freely for a time, the skin finally and permanently closing 36 days after operation. No attempt was made to investigate the circumflex nerve at either operation.

At the present time, three years after the operations, the head of the bone was in place and there was full range of passive motion. The deltoid, however, was completely paralyzed, with marked interference with the function of the joint. The spinati had apparently maintained their attachment, as there was about

suture would cut through until there was no longer any ;  
and then it would act as a foreign body. He stated that, within  
single year, he had recently operated upon two cases in ,  
adult women, for sinuses following an operation, developing .  
year after the introduction of silk sutures, at two of the lead-  
German Clinics.

DR. MOSCHCOWITZ said he did not wish to imply by his  
that permanent sutures were necessary, but that it was import-  
to choose a suture material that would last longer than did chromi-  
cized catgut. It took longer than twenty or twenty-five days to  
get union between the conjoined tendon and Poupart's ligament.  
In reply to the remarks of Dr. Coley, he would say, that he knows,  
that Dr. Coley uses kangaroo tendon as suture material, which  
may more properly be classed among the unabsorbable sutures.

DR. GERSTER said that perhaps twenty-five years ago he used  
silk exclusively as a suture material and for a time found it very  
satisfactory, until he had a series of infections which were trace-  
able to imperfect technic in the preparation or handling of the  
sutures. Since then he had relied on chromicized catgut. At his  
division at Mt. Sinai Hospital, where hernia cases were operated  
on by five different surgeons, results, on the whole, had been  
very favorable. Personally he did not entirely accept the explana-  
tion given by Dr. Moschcowitz for occasional recurrences, and was  
inclined to attribute them, not so much to the technic or to the  
suture material, as to the natural tendency of the tissues of some  
patients to be non-resistant and flabby. Such tissues give way  
easily. With the very first stroke of the knife we could often  
recognize this inherent quality of the tissues—whether friable or  
tough. Some tissues tore readily, and it was probably this quality  
that was responsible for the original development of the hernia.  
While there were other factors, no doubt, this was one of the  
features that should not be disregarded.

DR. LUSK said that since the last meeting of the Society, when  
his case of transplantation of the rectus muscle by a special technic  
was first briefly described by him, he was told by Dr. Hotchkiss  
that he likewise had for some years practised suturing a flap  
from the front of the rectus sheath, as well as the rectus muscle,  
to Poupart's ligament, and that the operation was original with  
Drs. Halsted and Bloodgood. Dr. Lusk said that in the meantime  
Drs. Halsted and Bloodgood had kindly supplied him with the

of clear serum expressed. There was still motion to be felt at the site of the fracture, eight and a half weeks after the original injury.

#### OPEN OPERATION FOR FRACTURE OF THE CLAVICLE: MIDDLE THIRD.

DR. DARRACH showed a man, forty years old, who on January 30, 1913, fell, striking his left clavicle against a corner of stone. He was treated at several hospitals and dispensaries, first with a Velpeau and then with a Sayre. While the latter bandage was in place he complained of anaesthesia over the ulnar aspect of the hand, with loss of power in his fingers. He was admitted to the hospital twenty days after the receipt of his injury and an operation was advised, but it was postponed for a week, as he was running a little temperature, due, apparently, to pulmonary conditions.

On March 1, 1913, an open reduction was done, and a 4-screw vanadium steel plate applied, the Lane technic being carefully observed. The dressing was changed on the third day, as his temperature had ranged between  $100^{\circ}$  and  $101.2^{\circ}$ . There was a little puffiness at one point of the wound, and on separating the skin edges, perhaps five drops of what looked like melted fat were evacuated. The wound was swabbed with Churchill's tincture of iodine; it healed without further discharge and had remained closed since. A culture of the discharge showed staphylococcus.

At the time of the operation, the inner end of the outer fragment was found to be pressing on the lower portion of the plexus. One of the screws inserted in the bone plate became loosened, allowing a slight displacement, but the general position of the bone remained good. The bandages were finally removed at the end of 26 days. The local anaesthesia had disappeared, and the muscles were beginning to contract feebly. There was still a good deal of limitation of motion in the entire extremity, which was decreasing under massage and passive motion.

Dr. Darrach reported one other case of a badly lacerated, compound, comminuted fracture of the tibia and fibula where the plate had to be removed because of infection. In that case, the sinus persisted for about six months. It remained healed for six months, when he died six weeks after an abdominoperineal proctectomy for carcinoma.

## LYMPHOCELE SIMULATING FEMORAL HERNIA.

DR. WILLIAM B. COLEY presented a boy, nineteen years who consulted him on February 21, 1913, with the history of having always been in good health up to two years ago, when noticed a small swelling in the right femoral region. This gradually increased in size and had never been reducible either lying down or on pressure. It had never caused any pain. had been examined in the out-door department of one of leading hospitals in New York a few days before, and the condition was pronounced a femoral hernia by two surgeons, advised an operation.

Examination showed a tumor in the right femoral region, by three inches in diameter, situated directly over the femoral opening. The tumor extended outward, over and beyond the femoral vessels, and downward about three inches. The overlying skin was normal. The tumor was irreducible on pressure. There was no direct impulse on coughing; only a transmitted impulse. Palpation showed the swelling to be unlike that of a femoral hernia, in that, instead of a single pouch or sac, it appeared to be made up of a series of small lobules or cysts, and gave an impression not unlike that of a lipoma. The lobules were more or less loosely connected.

Dr. Coley said that while he felt positive that the condition was not a hernia, he was uncertain as to its actual nature, but was inclined to believe it was a lipoma, and advised operation. After twenty-four hours rest in bed there was a considerable decrease in the size of the tumor, which added still more to uncertainty as to its nature. Upon incision, he found a tumor made up of numerous small cysts or dilated lymph spaces extending up to the femoral canal. As many as possible of these were removed and the wound was closed without drainage. It healed by primary union.

After the patient left the hospital the swelling soon reappeared and had steadily increased in size until at present it was nearly two-thirds as large as it was at the time of the operation.

Dr. Coley said that in nearly 100,000 cases of hernia observed at the Hospital for the Ruptured and Crippled since 1890, similar case had been seen, so far as he was aware.

DR. HENRY H. M. LYLE said that at a meeting of the Society

(2 per cent.) dressings for 9 weeks. The great toe became black and was amputated and the pain was considerably relieved. The wound did not heal. Two months later (July, 1902) the pain recurred. In the next year and a half the patient was treated at dispensaries, he suffering great pain and getting around on crutches. In February, 1904, he was admitted to Bellevue Hospital where he remained for 13 months. In the summer of 1904, all the remaining four toes of his left foot dried up and dropped off. On October 15, 1904, the foot was amputated (Pirogoff's amputation) by Dr. Bryant, resulting in complete relief of the pain. About a year later the patient returned to his former occupation again, plying the same heavy sewing machine, but now with his right foot only, he wearing a left artificial leg.

He was then well until November, 1910, when his right calf began to cramp when he walked. He now gave up the use of the foot-power. The cramp grew progressively worse and about November, 1911, he began to have a burning pain in the great and little toes, much worse in the latter, of the right foot, which he characterizes as "awful" and "something terrible." A little later there developed in his little toe and outer side of the sole of his foot a "freezing" pain which was much less endurable than the burning pain. In December, 1911, the great and little toe-nails fell off. Early in January, 1912, no arterial pulse could be felt in the right leg and the circulation was poor. The patient then entered St. Vincent's Hospital where he was treated with heat and Bier's hyperæmia, an elastic bandage being applied around the thigh daily for 20 minutes, sufficiently tight to cause slight venous congestion. Bier's negative pressure previously applied to a case somewhat akin to this one, by Dr. George D. Stewart, had been followed by relief of the symptoms. After 5 weeks of treatment with the elastic bandage, there was in this present case little or no pain remaining, the foot was no longer cyanosed when it hung down, and the patient was sleeping well. The patient was then free from pain until July, 1912, the great toe-nail in the meantime having grown again.

With the recurrence of the symptoms he again entered St. Vincent's Hospital, the end of last August. The use of the elastic constriction again, combined with mixed treatment, now gave no relief whatever. The patient suffered severely again from what he termed the "freezing pain" which affected the little toe

of the entire extremity, and the patients came under his observation several months after the occurrence of the injury.

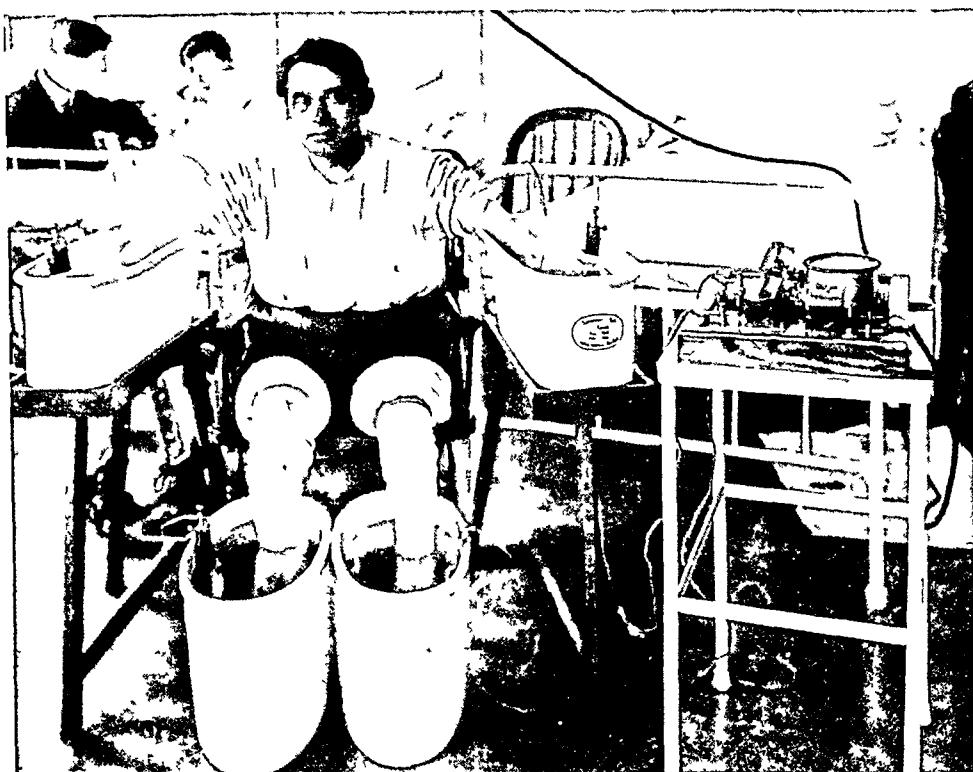
In operating on these cases, Dr. Kammerer said, he had made an incision along the posterior border of the sternocleidomastoid, continuing it along the clavicle in an outward direction, and finally passing over the clavicle into the axilla. The clavicle was divided in its outer half. Although this incision gave a large exposure, in none of his cases was he able to find the central ends of the nerves so that a satisfactory suture could have been applied. Only in the last case was he able to identify the short stumps of the third and fourth cervical nerves, to which he sutured the peripheral ends of the plexus. In one of the cases, after a most painstaking dissection, no nerve-ends were found issuing from the spinal column and no attempt at suture was made.

In the last case a few strands were found coming from spinal column at one point, but the final suture was at the ends and seemed to hold out little promise of success.

These three operations had been done four and five years ago and up to the present moment very little improvement, if any, had followed in the two cases in which suture had been attempted. The speaker had been impressed by the great difficulty in dissecting out the scar-tissue, when several months had elapsed since the injury, and he thoroughly agreed with Dr. Taylor that early operation should be done if better results were expected.

DR. CHARLES H. PECK said his experience with this condition was limited to a single case, that of a patient who came to him two years ago last October, and whom—if he remembered rightly—he showed at a meeting of this Society shortly afterward. The patient was a professional bicycle rider who sustained a fracture of the clavicle, and when Dr. Peck saw him, five weeks later there were evidences of complete paralysis of the fifth, sixth and seventh cervical nerves. Upon exposure, these nerves were found to be completely torn across just outside the intervertebral foramina, and after dissecting out the cicatricial tissue he was able to do a fair approximation of the fifth and the sixth nerves, but of the seventh, which he finally succeeded in implanting into the eighth. For several months after the operation there was functional improvement. It was now about two and a half years, and when Dr. Peck last saw the patient, perhaps a month ago, he found that the tone and function of the muscles had been re-

FIG. I.



The Schnee four-cell electric bath used in the treatment of a case of endarteritis obliterans. The current is taken from a fixture through a rheostat. The positive pole is connected with the electrodes in the foot tubs, and the negative pole with the electrodes in the hand tubs. A current of 30 ma, for 10 minutes, used at the beginning with favorable result, later caused pain, so that the strength had to be reduced to 10 ma. for 10 minutes to obtain the proper therapeutic effect.

pieces of flat brass which entered slots cut in the strips. Soldering made the four pieces of metal one.

The principle of the instrument was that when it was pressed firmly upon a rib it would seat itself with considerable rigidity upon the rib, and the slot of the instrument would over-lie the middle of the rib. Hence the knife, cutting in the slot, would find its way directly to the bone of the rib, making one clean cut without shifting of the tissues, very rapidly and without hemorrhage until the instrument was removed, when any vessels could easily be caught. The slight curve in the instrument adapted it sufficiently to the curve of the ribs. The narrower face of the instrument was intended for cases where the ribs were small, the larger face for cases where the ribs were broader. In making a fairly long incision it was well, on account of the cylindrical shape of the chest, to rock the instrument, so that the greatest pressure would be at the point where the knife was cutting.

Dr. Dunham said he devised this instrument over three years ago and had used it in more than twenty cases of rib resection for empyema. It had never failed to guide his knife to a rapid and clean division of all the tissues down to the rib.

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*Stated Meeting, held at the New York Post-Graduate Hospital  
May 14, 1913.*

The President, DR. CHARLES L. GIBSON, in the Chair.

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#### RUPTURE OF THE LIVER IN A CHILD.

DR. JOHN F. ERDMANN showed a boy, six years old, who admitted to the Gouverneur Hospital with the history that he had been run over by a truck. Examination showed a rapid pulse and marked abdominal tenderness. Within two hours after the receipt of the injury, Dr. Erdmann opened the abdomen through a median incision above the umbilicus, disclosing rupture through the right lobe of the liver. This was repaired with several stitches and the abdomen then closed with drainage. Recovery was uneventful.

#### RUPTURE OF THE JEJUNUM IN A CHILD.

DR. ERDMANN presented a boy, six years old, who was admitted to the hospital with the history that while running

grown more sensitive to the electrical stimulation, with the same strength of current a marked augmentation of the pain would come on during the bath, so that the current had to be reduced considerably to re-establish the therapeutic effect of the treatment. On December 11, 1912, the patient made the observation that the nails and hair of his toes had begun to grow again after a period of indolent growth, in the previous two years he having been obliged to cut his toe-nails only 2 or 3 times, whereas in the past month he had cut them twice. On January 9, 1913, it was recorded that in the day-time when the patient sat with his right leg flexed and foot in a chair, the pain did not bother him, but as soon as he lay down the pain would start up. Warmth was always grateful and he usually sat close to the radiator. The foot and leg were kept wrapped in cotton and a fur-lined shoe was worn. On this date it was discovered that the baths were being given with the negative wire attached to the foot tubs and the positive wire to the hand tubs. The patient was sure that this disposition of the wires had not varied from the beginning of his treatment, yet it was known that the direction of the current was originally started right. The poles were forthwith connected with their proper electrodes. On February 1 it was recorded that since the readjustment of the poles, on January 9, the improvement had been progressive. The patient was still comfortable in the day-time, and at night the pain would come and go at intervals so that the patient could usually get 3 or 4 hours of sleep. Jumping of the leg at night had been arrested by a plaster splint. Raising the head of the bed seemed to diminish the pain at night.

During the latter part of January the patient began to notice that there was an increased sensitiveness in his legs to the electrical stimulation in the bath, which increased to such an extent that by the middle of February the bath after the first 4 or 5 minutes actually excited pain in the right foot, so that on February 17 the strength of the current was reduced to 20 ma. On February 24 it was recorded that the pain not only continued to be excited by the baths, but it was now excited also by walking "even by two steps." The pain, which was intermittent, lasting about  $1\frac{1}{2}$  hours and then arresting for about  $1\frac{1}{2}$  to 2 hours, was now worse in the day than at night. It affected chiefly the little toe and the outer side of the sole of the foot. On February 25 the bath was omitted and the pain was worse.

be relieved by vomiting. The patient had lost 20 pounds weight during the past three months.

An examination of the blood showed 7000 leucocytes was otherwise negative, as was also the urinary and the Wassermann. An analysis of the gastric contents show considerable retention, with a total volume of 275 c.c.; free chloric acid, 19; combined, 9; total acidity, 36; no blood. fluoroscopic examination, made by Dr. L. Kast, showed evid. of marked gastric retention, and an obstruction of some kind probably a tumor, in the duodenum, the first portion of whi was markedly dilated, with the hepatic flexure drawn b.i the duodenum and the median line. From these findings, Kast made the diagnosis of stenosis of the mid-portion of duodenum.

Operation, January 14, 1913: This revealed a marked tation of the pylorus and the first portion of the duodenum, an annular constriction of the duodenum at the ampulla of V. The gall-bladder was greatly dilated with fine biliary sand. cholecystostomy and posterior gastro-enterostomy were done, the patient left the hospital twenty-one days later, appa well. Two weeks later he had a discharge of bile from healed cholecystostomy wound, with the development of j dice. He was re-admitted to the hospital on April 11, and wh the abdominal wound was re-opened it was found that the tum which had constricted the jejunum, had become mushroom-1 in its growth and about three times its original size. A loop jejunum was brought out and anastomosed to the gall-bladder cholecystjejunostomy. The patient left the hospital 4 after the second operation with a gain of 20 pounds.

#### ACUTE PANCREATITIS: TWO CASES.

DR. ERDMANN presented a man, fifty years old, who after history of gall-bladder disease dating back three years had sudden attack of sharp pain, with profound jaundice and cyanosis and dyspnœa. He was admitted to the hospital, was operated on by Dr. Erdmann on the third day of his atta. Upon opening the abdomen, he found a hemorrhagic p with fat necrosis. A cholecystectomy and choledochotomy done. A fistula (*mucus*) persisted for 18 months with taneous closure.

chiefly after going to bed, on the dorsum or at the base of the little toe, on two nights it waking him from his sleep for a few minutes at a time, and on another night (May 12) it making him quite restless. Twice in this period of time, with the occurrence of a little swelling of the little toe, a drop of retained pus was let out from the diminutive sinus in this toe.

The color of the toes has recently been made a matter of observation. The little toe is the one most liable to cyanosis. This toe, with the patient standing, has been seen to spontaneously change in color from bluish to a brilliant rose. The toes, on three successive days, have become a little dusky following moderate exertion in the morning, before the bath, but after the bath there seemed to be little tendency to cyanosis with ordinary exertion. On the morning of May 13 before the bath, after walking 50 feet, all the toes were slightly dusky, but after the bath, during the afternoon, and standing, the toes were found at each of several observations, to be always a good red color, excepting for a very faint bluish tinge around the scar on the little toe. Standing heavily on the right foot, however, toward evening, produced duskiness of all the toes within three minutes.

*In a second case of endarteritis obliterans the treatment of which has just been begun, after the first electric bath (20 ma. for 10 minutes) the patient was entirely free from pain for 5½ consecutive hours, whereas previously the intervals of relief had been of no longer duration than half an hour, and after his second bath (10 ma. for 10 minutes) the relief from pain lasted 9 hours.*

#### RECTUS TRANSPLANTATION BY A SPECIAL TECHNIC.

DR. WILLIAM C. LUSK said he presented this case for the purpose of bringing up for discussion the question as to what was the best technic for performing Bloodgood's operation of transplanting the rectus muscle.

He said the patient was one in the service of Dr. Bissell at Bellevue Hospital; that he had a recurrent inguinal hernia which was direct, and that repair was effected in accordance with the technic shown in the illustration and described herewith, excepting that the outermost stitch in the rectus sheath also included the rectus muscle instead of there being separate stitches at this situation; that the patient was operated on November 30, 1912, and

Dr. Erdmann said this specimen had been submitted to several pathologists, and various opinions had been given as to its nature. Some regarded it as the remains of the Wolffian duct, others said they did not know what it was.

#### SKULL DEFECT, WITH TIBIAL GRAFT.

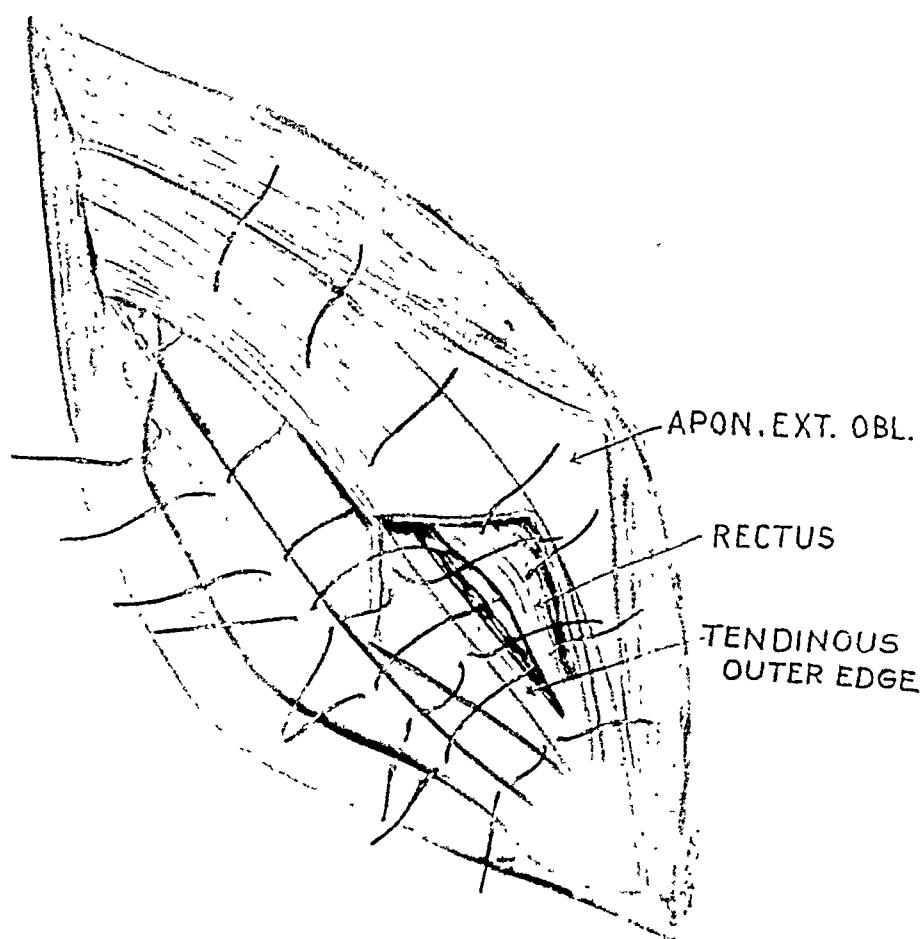
DR. ROBERT T. MORRIS presented a man twenty-five years of age, who entered the Post-Graduate Hospital on April 4, with a depressed pulsating area at the site of an injury to the frontal bone. Fracture of the skull had been produced at this point with a beer bottle some months previously, and some bone had been removed at the Bushwick Hospital in Brooklyn.

In order to remedy the skull defect, Dr. Morris had made a tibial transplantation, using a quadrangular segment about  $1\frac{1}{4}$  inches long and  $1\frac{1}{8}$  inches wide, and fitting it into a corresponding space in the frontal bone. Primary union followed. The patient left the hospital two weeks later. Sixteen days after that, he returned with a transverse fracture of the tibia at the site from which the bone graft had been removed. While rising from a chair, with his left foot slightly flexed and abducted, he put his weight upon it and felt the tibia snap. Dr. Morris said that he had heard of four cases similar to this one very recently, and he believed it very important to give warning of the danger, now that tibial grafts are being used so extensively. The reason for the fracture at this point, where the bone would seem to be sufficiently strong, was due to the mechanical feature of destruction of the reed principle, when a segment of the firm outer layer of the reed had been removed. The patient is now comfortable with a plaster-of-Paris splint, and the radiograph showed the fragments in perfect position.

#### OSTEOPLASTIC OPERATION ON THE FOOT FOLLOWING INJURY.

DR. MORRIS presented a civil engineer, twenty-five years of age, who entered the Post-Graduate Hospital on February 14 with ankylosis of the right ankle-joint. Two years before, the foot had been injured in a street car accident, and the patient had been treated with a plaster cast at the Toronto General Hospital for four months, good repair having been obtained so far as the compound fracture was concerned.

FIG. 2.



This technic represents only what has already been done by others. Wolfier (*Beiträge z. Chir. Festschrift f. Th. Billroth*, 1892), who was the first to transplant the rectus muscle, did it through an anterior opening in the sheath. Halsted (*Johns Hopkins Hospital Bulletin*, August, 1913), in 1890, originated the turning over of a flap cut from the aponeurosis covering the front of the rectus muscle with suture of the same to Poupart's ligament, to close the lower part of the inguinal canal. Berger (*Revue de Chirurgie*, January, 1902) also originated a similar flap for the repair of inguino-interstitial herniae. Bloodgood, with whom transplantation of the rectus muscle was also original, originally transplanted the rectus muscle through a posterior incision in its sheath (*Johns Hopkins Hospital Rep.* 1898-99) but later adopted the triangular flap from the front of the rectus sheath devised by Halsted, and then transplanted the rectus muscle through this anterior opening in the sheath, sewing the flap from the sheath and the rectus muscle each to Poupart's ligament by a separate row of sutures (*Internat. Clinics*, 18th Serie, vol. i, 1906, p. 266). In the dissection the outer edge of the rectus muscle was tendinous and closely attached to the posterior layer of the sheath, and was therefore split through instead of dissected free, in order to raise the belly of the muscle.

inferior diameter about five inches long and its lateral diameter about four inches.

Operation, May 25, 1912: An incision was made on the left side extending from the twelfth rib for about five inches through the muscles and the fatty capsule of the kidney. A large cystic mass was found in the depth of the wound. A second incision was then made approximately at right angles to the first, extending across the left side of the abdomen and partly on its anterior surface. The mass was then removed from its capsule and the pedicle ligated with strong silk. The wound was closed, with split-tube drainage. The patient made an uneventful recovery and left the hospital on July 24, 1912. She also is in excellent condition to-day.

#### IDEAL CHOLECYSTOTOMY (KOENIG'S INCISION).

DR. MEYER presented a woman, a housewife by occupation, thirty-six years old, who entered the German Hospital on May 20, 1912, who for the past year or so had suffered from attacks of severe, cramp-like pains in the right abdomen. The pain came on suddenly, commencing on the right side of the back and radiating downward and forward on the abdomen. There was no rigidity of the abdomen, and no masses could be felt. There was an area of tenderness extending from the mid-axillary line under the costal border to the right mid-clavicular line on a level with the umbilicus.

The case was regarded as one of cholelithiasis, and on June 10, 1912, Dr. Meyer exposed the gall-bladder through a Koenig incision, beginning about an inch below the costal margin on the right side, extending across the right rectus and then upward toward the ensiform in the midline. Only the inner three-fourths of the right rectus were divided, together with its posterior sheath and the peritoneum. This semilunar incision gave excellent access to the gall-bladder, which was found to be soft and pale, and containing one large stone. The bladder was opened and the calculus extracted. The wound was then closed by a double row of sutures, and the patient made a good recovery.

In this case the appendix was found to be the seat of a subacute suppurative inflammation, and it was removed before doing the cholecystostomy. The abdominal wound was carefully closed by large sutures. At present the patient shows no symptoms of disease and is apparently cured. The abdominal scar is firm.

edge of the rectus muscle in the operative field was usually adherent to the posterior fascial layer of the rectus sheath, frequently by a tendinous attachment but sometimes only by fascia; and that when this attachment was a tendinous one, then to raise the muscle out of its sheath the outer border must be split through instead of dissected free, since to dissect it free would necessitate cutting through the posterior fascial layer of the sheath, thus impairing the support given by the latter fascia. He said that the transversalis fascia forming the posterior layer of the rectus sheath was generally a structure of much firmness, which, when firm, would give support to a poorly developed rectus muscle transplanted through the anterior route. In 5 out of 6 dissections on 6 cadavers, the posterior layer of the rectus sheath was one of considerable strength, but in one cadaver there was found in it at a situation a little above the pubic crest, a small area of weakness which offered but little resistance to the finger pressed through it from behind.

#### RECTUS TRANSPLANTATION FOR DEFICIENCY OF THE INTERNAL OBLIQUE MUSCLE IN CERTAIN CASES OF INGUINAL HERNIA.

DR. WILLIAM A. DOWNES said that at a meeting of the Society held at the New York Hospital over two years ago, he described a method of rectus transplantation which he had now employed in about 165 cases during the past four years. Of this total number of cases he had been able to keep trace of about 60, and in only one of those had there been a recurrence. All of these cases were either of the direct or combined indirect and direct variety. Although the method he had described was more complicated and necessitated more handling and dissection of the tissues, he has never seen infection occur.

DR. WILLIAM B. COLEY said he agreed with Dr. Schley in regard to the necessity of transplanting the rectus muscle in every case of direct hernia and in certain cases of indirect hernia. There were various methods of doing this since that first described by Bassini, and later by Wolfler and Bloodgood. Personally, Dr. Coley said, he favored that of Dr. William A. Downes, which had the particular advantage of placing two different layers of sutures under the cord, whereas with the other methods there was only a single layer. The speaker said he had followed this method in a

he noticed a small lump under the skin to the right of the umbilicus. During the first two and a half years this tumor gradually increased in size until it was as large as an infant's head. It was removed, only to recur in the same location about fifteen months later, and a year and a half ago it was again removed. Since then there had been a swelling within the abdominal wall of about the size of an orange, in the region of the gall-bladder transgressing the middle line, and a smaller tumor at the lower end of the operative wound over the bladder region. These growths were absolutely painless and gave rise to no symptoms. There was no loss of weight and the patient otherwise appeared to be in excellent health. Diagnosis: recurrent fibrosarcoma.

First operation, January 21, 1913: Upon exposing the supra-pubic tumor it was found to be adherent to the peritoneum; it could be excised without opening the latter. The extensive gap in the abdominal wall was closed with the aid of a silver wire filigree, made in the spot. Cable silver wire was used. On several occasions after the operation, the dressings were found to be saturated with blood. It was then learned that the same had been observed in the two previous operations and the patient was pronounced a haemophiliac. It took more than ten weeks before the wound had closed by granulation. The wire had to be removed.

Before attacking the tumor above, preparatory hypodermic injections of human blood serum were administered about ten ounces in all, the blood having been derived from a healthy relative of the patient. On April 28 the abdominal wall in the right hypochondriac region was excised in its entire thickness, excepting the skin, and as large as the palm of the hand. On inspection a large infiltrating tumor was found in the liver. Another organ was not affected. It was deemed inadvisable to remove a portion for diagnosis. Now the omentum was spread out and stitched to the borders of the large defect and the gap covered by a filigree of various sizes of cable silver wire. On top of this the skin was closed without drainage. Primary union followed, a secondary hemorrhage did *not* set in. The abdominal wall appears perfectly firm. Pathologically the growths were pronounced rhabdomyomata, clinically they had to be considered fibrosarcoma. It will be interesting to observe the further course, particularly on

wrote a paper in which he reported his experiments with the use of silk, cotton and linen sutures, and referred to the advantages of the latter as a suture material. Practically, since that time, Dr. Dawbarn said, he had discarded silk and had substituted linen. He understood that the Mayos were also using linen of late, in all abdominal work. Originally the strongest of the three suture materials named, linen is not, like silk, weakened by the necessary boiling for sterilization; and as Dr. Meyer proved that all three are equally well tolerated by the bodily tissues, there seemed left no excuse for employing silk.

A point worthy of remembrance, Dr. Dawbarn added, is that both linen and silk, when the smaller sizes are used, are capable of being absorbed and disappearing; but this only after a much larger period of time than any kind of material requires, ordinarily classed as "absorbable."

DR. L. W. HOTCHKISS said that Halsted did not transplant the rectus muscle, but he turned over the transversalis flap from its anterior sheath, and joined it to Poupart's ligament. He did not use the muscle because he did not believe it would hold.

DR. COLEY said that he could not let the opportunity pass without saying a few words in the defence of absorbable sutures in hernia operations. Many years ago, the late Dr. Wm. T. Bull, together with the speaker, published a series of cases of hernia in which various kinds of non-absorbable sutures had been used with serious after-results in the way of sinuses and prolonged suppuration. In one case with primary union, in which silkworm gut had been used, a sinus developed at the end of six months, another  $2\frac{1}{2}$  years later and a third 3 years and 8 months after operation. Not until all the sutures had been extricated did the sinus formation cease. (In this case the long-continued suppuration resulted in a recurrence of the hernia.) Similar results were seen following the use of silk and silver wire. The speaker said that he believed that the statistics of the Hospital for Ruptured and Crippled, covering a period of 23 years and including nearly 4000 operations in which chromicized kangaroo tendon had been used with less than 1 per cent. of relapses, were sufficient to prove that non-absorbable sutures were unnecessary in hernia operations. Dr. Coley stated that any suture that remained in the hernial canal unabsorbed longer than 3 to 4 weeks did harm rather than good. If there was any tension upon a suture after this period, such

TOTAL ANKYLOSIS OF THE LOWER JAW FOR TWENTY-TWO  
YEARS: BILATERAL RESECTION OF THE  
CONDYLOID PROCESSES.

DR. MEYER presented a man, twenty-eight years old, who when he was six years of age fell on his chin. Not long afterward his trouble began. As long as he can remember he was unable to open his mouth. When first seen, patient showed the typical symptoms of micrognathia. Lower jaw much arrested in development, anterior curve of bone at least one inch inward of that of the upper jaw; teeth of inferior maxilla grown forward in oblique direction, as seen in a horse, but their crowns do not meet their opponents; all teeth are present and in good condition; there is a space of about one-sixteenth of an inch between the two rows of incisor teeth. The jaw's articulation with the temporal bone appears to be totally ankylosed on both sides. One is able to palpate a broad bony mass in front of each external auditory meatus. X-rays corroborate this condition. Operation, done eight weeks ago, demonstrated the total absence of a mandibular joint on either side. A large bony mass, one and a half inches wide, thick, eburnated took the place of the condyloid and coronoid processes. A large piece of the bone was resected bilaterally, a flap of fascia or muscle was not turned into the resulting cavity, because the wound, had to be tamponed (with sutures placed, but not tied), on account of rather profuse hemorrhage. Tampons were removed and wounds closed 48 hours later. To-day patient can open his mouth nicely, although the muscles, which have to pull the jaw downward are not developed. The next step is removal of the lower molars with chisel and a prosthesis with a set of lower teeth, attached to those present, which will enable the patient to masticate.

WIRING OF AORTIC ANEURISM.

DR. MEYER presented an Italian, fifty-seven years old, who was admitted to the German Hospital on July 26, 1912, with the history that for the past two years he had suffered from pain in the chest, with dyspnoea and a more or less constant cough. He had sciatica sixteen years ago, and a chancre a year later. He was under treatment for syphilis for only two weeks.

Examination of the chest showed an area of cardiac dulness

literature on the subject. Wölfler (*Beiträge z. Chir. Festschrift f. Th. Billroth*, 1892, p. 552) was the first to transplant the rectus muscle, which he did through an anterior opening in the sheath. Bloodgood (*Johns Hopkins Hosp. Bulletin*, May, 1898, and *Johns Hopkins Hosp. Reports*, vii, 1898-99) without previous knowledge of Wölfler's operation transplanted the rectus muscle through a posterior opening in the sheath. Then Halsted (*Johns Hopkins Hosp. Bull.*, August, 1903), in 1899, in a case in which the internal oblique was "fatty and attenuated," used for the first time a part of the aponeurosis covering the rectus muscle to close the lower part of the inguinal canal. After 3 years the closure was still solid. Berger (*Revue de Chirurgie*, January, 1902) almost simultaneously with Halsted sewed a flap taken from the front of the rectus sheath to Poupart's ligament, in operating for inguino-interstitial herniae. His flap was 8 to 10 cm. in length, and to support the area weakened by the cutting of so large a flap, the outer edge of the rectus muscle was sutured to the displaced structures were apposed by a special plastic procedure. Afterward Bloodgood (*Internat. Clinics*, vol. i, 18th series, 1908, p. 296) revised his method of rectus transplantation, adopting the triangular flap from the front of the rectus sheath devised by Halsted, transplanting the rectus muscle now through this anterior opening in the sheath, and suturing the flap from the sheath and the rectus muscle each to Poupart's ligament by a separate row of sutures.

Regarding tension on the sutures uniting the internal oblique fibres to Poupart's ligament in indirect herniae, Dr. Lusk said that Dr. Halsted (*ibid*) overcame this difficulty when present, by a vertical relaxation cut through the front of the rectus sheath.

DR. SCHLEY, in closing, said that what he wanted to emphasize was that the amount and extent of internal oblique muscle should determine the method of operation. The indication for rectus transplantation or transposition was deficiency of the internal oblique of such a degree that proper protection could not be secured with the straight Bassini. In certain cases where enough oblique muscle was present to be worth utilizing internal to the transplanted cord the combined operation was of value. In marked oblique deficiency the rectus sheath could be opened anteriorly, by the method he had spoken of, a quick simple procedure. He was not in favor of using a non-absorbable suture when the absorbable would do the work and then disappear.

the lung was gradually loosened from the lateral chest wall, and the rather firm adhesions also those to the diaphragm were put on the stretch and cut close to the latter in order to avoid injury to the lung tissue. The region of the oesophagus was now well exposed, but firm scar tissue was met with next to the aorta; this was incised, and the finger gradually worked around the oesophagus. This was very difficult and time-consuming, but was finally successful. The pneumogastric nerves which were firmly adherent to the oesophagus, were again carefully loosened and pushed aside, the aorta loosened, and a cardioplasty made according to the Heinicke-Mikulicz method at the pylorus. The old scar tissue interfered much with this work, as only about one inch of the cardiac portion could be pulled upward. The longitudinal incision of the oesophagus, one inch long, was then stitched in the transverse direction by two rows of sutures and the wound covered by a free fascia transplant from the fascia lata of the left thigh. Recovery was slow, but continuous, patient is still under treatment. Swallowing is much improved.

#### CANCER OF THE OESOPHAGUS: JIANU'S GASTROSTOMY AND INFERIOR OESOPHAGOPLASTY.

DR. MEYER presented three patients operated on by him by this method recently. The procedure was carried out with needle and thread throughout (one patient), and also, when cutting out and forming the Jianu tube, with Hueltl's wire stitching instrument (two patients). See article on oesophagoplasty, ANNALS OF SURGERY, September, 1913.

#### PNEUMOTOMY FOR LOCALIZED BRONCHIECTASIS AND GANGRENE.

DR. MEYER presented a woman, twenty-eight years old, with localized gangrene of the right upper lobe following a severe ether (aspiration) pneumonia after extirpation of an ovarian cyst. When seen there was high fever and very foul smelling expectoration. The disease could be well located by clinical examination and X-rays. Operation, March, 1910, with patient's head in plus pressure cabinet, should differential pressure have become indicated. It was not required during operation. Resection of second and third rib with cartilage, intercostal tissue removed. Lung cavity opened with cautery, finger introduced and a num-

## TRAUMATIC ERB'S PALSY IN ADULTS.

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in October, 1912 (vol. Ivi, page 942), he showed a case of bilateral femoral adenolymphocele of filarial origin. The patient was a negro, twenty-one years old, from St. Kitts, West Indies, who four years previously had noticed a lump in each groin. The swellings were soft, painless, disappearing on lying down and reappearing on standing. During this time he had also suffered from periodical attacks of pain in the lower abdomen, and during one of these he was operated on for acute appendicitis in some hospital in this city. He obtained no relief from the removal of his appendix. There was no history of chyluria. The periodicity of the attacks had led to the diagnosis of malaria, while the abdominal pain had suggested appendicitis, diverticulitis, etc. Later, with greater prominence of the femoral swellings, the diagnosis of femoral hernia and strangulated femoral hernia were made. Upon further examination, however, and after several blood tests, microfilaria were found in the blood, and the diagnosis of adenolymphocele was made and the glandular masses in both groins excised. The lymphatics were greatly enlarged and it was found necessary to tie and cauterize a number of the lymphatics to check the escape of fluid. The wounds healed by primary union and there was no resulting lymphorrhea nor elephantiasis.

Dr. Lyle said that upon looking up this subject more thoroughly, he felt that the best method was to avoid operating in these cases.

DR. DARRACH said he recalled one case where upon operating for a supposed inguinal hernia they found a large mass of lymphatics instead. The filarial organisms were not discovered in that case.

## TRAUMATIC ERB'S PALSY IN ADULTS.

DR. ALFRED S. TAYLOR and DR. LOUIS CASAMAJOR read a paper with the above title for which see page 577.

DR. F. KAMMERER said his experience with three cases of Erb's palsy had been a rather discouraging one. In all of his cases there was avulsion of the brachial plexus. One was that of a young man who fell from his bicycle, striking on his head and shoulder. The second was that of a young woman who was thrown from an automobile, and the third was that of a man about thirty-five, who was struck upon the shoulder by a heavy load. In all of his cases there was complete motor and sensory paralysis.

TRANSACTIONS  
OF THE  
PHILADELPHIA ACADEMY OF SURGERY.

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*Stated Meeting, held May 5, 1913.*

GEORGE G. ROSS, M.D., in the Chair.

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ACUTE GASTRIC DILATATION FOLLOWING OPERATION  
FOR HERNIA.

DR. JOHN SPEESE presented a man, fifty-six years of age, who was operated upon at the Presbyterian Hospital for an incomplete inguinal hernia by the Bassini method. The patient recovered consciousness readily and experienced but slight nausea from the ether. Thirty-four hours later, after drinking a small quantity of milk, he complained of nausea, which gradually became more severe, and was followed by vomiting two hours later. Temporary relief was experienced, and no alarm was felt as the temperature, pulse and leucocytic count were normal and the abdominal muscles relaxed. The vomiting recurred, the fluid was dark in color, odorless and was ejected in small amounts without effort every few minutes. The patient then developed considerable abdominal pain, and on examining the abdomen at this time, the stomach was found greatly dilated, extending to the umbilicus, and partially filled with fluid, as determined by a succussion splash. A stomach tube was passed and several quarts of dark fluid withdrawn, and lavage performed. An abdominal binder was applied and the patient turned on his abdomen, a position he could assume only for short periods.

He was entirely relieved of the pain and vomiting for six hours, when the latter recurred in a less severe form. The same treatment was carried out and permanently relieved the condition. Examination of the stomach twelve hours after the vomiting began, disclosed a normal state of affairs, the dilatation having perfectly subsided. The patient was given salt solution by rectum to relieve his thirst, and small quantities of water by

### THE RIB-FINDER.

gained to a very great extent; he was still unable to abduct his arm, but the atrophy of the deltoid had disappeared and it contracted strongly; the same was true of the extensors of the wrist, though the wrist drop was not entirely overcome. Regeneration of biceps and brachialis was practically complete.

DR. HOWARD LILIENTHAL said Dr. Taylor made no mention of the immediate repair of these injuries, merely stating that the operation should be done at the earliest moment after the effects of the original traumatism had subsided. Personally, the speaker said, he had had no experience with these cases, but he saw no good reason why we should not follow the ordinary surgical rules and operate immediately after the injury, cleaning out the blood clots and doing an immediate repair.

DR. KAMMERER thought a distinction should be made between those cases that were associated with a skeletal injury, such as a fracture of the clavicle, and those that were not.

DR. TAYLOR, in closing, said that in cases like those referred to by Dr. Kammerer, where the roots were apparently torn out of the foramina, the outlook was very bad. While it was desirable to operate early in these cases, Dr. Taylor said he had never seen a case earlier than the eleventh day, and we were more apt to see them much later, as the injury was so frequently unrecognized, and these patients floated from one clinic to another.

### THE RIB-FINDER.

DR. THEODORE DUNHAM showed an instrument, which he had devised for the purpose of facilitating the resection of a rib. It steadied the tissues over the rib, arrested hemorrhage while the soft parts were being cut, and guided the knife from the time of the incision of the skin to the severing of the periosteum along the middle of the rib.

The instrument was composed of one solid piece of metal, and he said the description of it would perhaps be most intelligible if it were regarded as being made up by the assembling and soldering together of four pieces. Two strips of flat brass were laid parallel to one another and rotated in opposite directions until two of their edges were about one-eighth of an inch apart, while the other two edges were about three-fourths of an inch apart. The strips were given a slight curve, while their parallelism was maintained. These strips were now joined together at their extremities by two

stomach which occurred about the seventh day after an operation in an otherwise healthy young woman who had pus tubes. She had done very well until the night of the second day when she drank the contents of an ice-bag (about one quart). The next morning she had acute dilatation from which she promptly died in spite of all treatment; the water from the ice-bag being the supposed cause.

#### RETROPERITONEAL ABSCESS.

DR. SPEESE reported the history of a child, eight years of age, who was admitted to Dr. Jopson's service at the Presbyterian Hospital, complaining of pain in the right wrist and left thigh. One week before he had been struck over the left hip, and in several hours the leg became stiff. This increased to such an extent that in three days the boy could not walk, and the thigh became very tender on pressure. The wrist also began to pain considerably and was slightly swollen.

September 5, 1912, four days after the accident, when admitted he complained of abdominal distention, pain and swelling over the lower end of the radius. The region about the hip was very tender, there was slight swelling on the outer side of the femoral vessels, and pressure over the trochanter caused pain. The temperature was  $103^{\circ}$ , W. B. C. 15,000. Exploration over the trochanter by Dr. Speese revealed normal bone and no evidence of pus. The lower end of the radius was exposed and free pus was found under the periosteum which was raised, the cortex of the radius was chiselled and several drops of pus found in the medullary cavity.

September 7, 1912, the pain in the hip region continued, and the abdomen was markedly distended, tender, but not rigid. W. B. C. 21,000.

September 9, 1912, an area of fluctuation was detected in the left groin, below Poupart's ligament and to the inner side of the femoral vessels. A large amount of pus containing blood clot was evacuated, and on exploring the abscess cavity it was found to extend behind the peritoneum for a distance of four or five inches. The abdominal distention disappeared after evacuation of the abscess.

The cavity was drained, and closed slowly as the convalescence was prolonged by the formation of several pyæmic ab-

## CARCINOMA OF PAPILLA OF VATER.

stumbled, and as he fell, he was thrown against a piece of projecting timber. The blow was received directly over the region of the umbilicus. The case was regarded as one of rupture of the ileum or jejunum. Exploration of the abdomen revealed a perforation of the jejunum, twelve inches from its origin, and upon exposing the appendix it was found to be œdematosus and was removed. The jejunal opening was closed. The abdomen was drained for 48 hours.

### PARTIAL GASTRECTOMY: POSTERIOR GASTRO-ENTEROSTOMY.

DR. ERDMANN presented a man, fifty years old, a druggist, who entered the Post-Graduate Hospital on April 14, 1913, with the history that for the past 25 years he had suffered from indigestion, with nausea and inability to retain certain vegetables. At times the nausea was associated with pain. His symptoms gradually became more aggravated until he was unable to take any solid food without experiencing severe pain in the region of the pit of the stomach, which would be relieved by vomiting. Operation, April 22: Upon opening the stomach, a tumor was found at the pylorus, with marked infiltration of the pyloric area. A partial gastrectomy and posterior gastro-enterostomy were done. The patient was discharged, at the end of 3 weeks, able to take all kinds of food.

### CARCINOMA OF THE PAPILLA OF VATER: CHOLECYSTOSTOMY: POSTERIOR GASTRO-ENTEROSTOMY.

DR. ERDMANN presented a machinist, forty-six years old, who entered the Post-Graduate Hospital on December 30, 1912, complaining of pain and vomiting after meals. His present illness dated back about three months, with pain in the epigastrium and vomiting, coming on from a few minutes to a few hours after taking food. The pain was located in the median line; it was colicky in character and was always relieved by vomiting. No blood had ever been observed in the vomitus, which consisted of previously ingested food, with mucus, with the occasional addition of a large quantity of greenish material. His symptoms gradually increased in severity until the pain would come on immediately after taking food of any character, only to

afterward in Dr. Rodman's service, and several of similar nature in Dr. Wharton's wards at the Children's Hospital.

DR. J. STEWART RODMAN recalled the particulars of a case which occurred at the Presbyterian Hospital, in the service of Dr. W. L. Rodman. The patient was a boy of ten who had been run over by a wagon three weeks previous to his admission to the hospital, thus giving a history of trauma more or less remote. The diagnosis was not altogether clear at first, as tenderness and fixation of the left hip suggested an acute tubercular arthritis. Later on, however, an easily palpable tumor appeared above Poupart's ligament on the left side which was quite tender to touch and accompanied by a septic temperature. The diagnosis of retroperitoneal abscess was now quite clear. This was opened extraperitoneally and the boy afterward made a rapid recovery.

#### PERFORATION OF ILEUM BY A FOREIGN BODY FOLLOWED BY SYMPTOMS SIMULATING APPENDICITIS.

DR. SPEESE recited the history of a man, aged fifty-three, who was admitted to Dr. Jopson's service at the Presbyterian Hospital with the following history: Two days previously he experienced a sudden and severe pain in the right iliac region, this was accompanied by nausea and vomiting. The pain which continued until his admission to the hospital, gradually became more severe, the nausea persisted but the vomiting ceased; the bowels had not moved for two days. The leucocytic count was 24,500, pulse 92, temperature 99.4°. The abdomen was slightly distended, and on palpation the right rectus muscle was rigid, and pronounced tenderness was present over McBurney's point.

A diagnosis of acute appendicitis was made and the operation which was at once performed by Dr. Speese revealed many recent adhesions about the cæcum, a small amount of turbid fluid and fibrin, but a normal appendix. Believing that an inflamed Meckel's diverticulum might have caused the condition, the ileum was drawn out of the wound and examined. About four inches from the ileo-cæcal junction a foreign body was felt in the lumen of the bowel, one end being firmly embedded in the intestinal wall almost penetrating the serous coat. The body was extracted and was found to consist of a flat piece of bone, 4 x 1 cm., resembling a sequestrum, one end was splintered and as sharp as

Dr. Erdmann's second case of acute pancreatitis was that of a man, thirty-five years old, who gave a history of very sharp abdominal pain, and upon admission to the hospital his temperature was  $102^{\circ}$ ; pulse, 120. Upon opening the abdomen for a supposed appendicitis, free fluid was found in the peritoneal cavity. A median incision was then made higher up, revealing an acute pancreatitis, without any evidence of fat necrosis. Liberal drainage of the pancreas by puncture and a cholecystostomy were performed.

## EXCISION OF REMAINS OF WOLFFIAN (?) DUCT.

DR. ERDMANN presented a man, a physician, whose family history was negative, and who gave no history of venereal trouble. In December, 1909, he had an attack of left pleuropneumonia, with effusion, and for six months following this illness he complained of vague pains in the back, with vesical tenesmus. His urine during this period contained pus, and a diplococcus (probably the pneumococcus) was more or less constantly present. The diagnosis of tubercular kidney was made at that time.

On July 7, 1910, the patient developed an acute septic condition, with chills and high temperature. He was seen by Dr. Erdmann, who found a large mass in the left iliac region. The prostate also seemed to be enlarged. A perineal section was done the following day and some pus evacuated. The perineal wound was re-opened twice during the summer and again in October, 1910, when a retention catheter was inserted, permitting free drainage. The tube was left in place for eighteen months, during which period the patient's general condition improved. The discharge from this opening was semipurulent, with a urinous odor, and was supposed to connect with a diverticulum of the bladder. It was treated by curetttement and various instillations, but failed to close, and finally, on April 10, 1912, a radical operation was undertaken. The abdomen was opened through a transperitoneal incision, revealing a mass which extended from the prostate up to the diaphragm. It was about seventeen inches in length, gradually developing into a large tumor under the diaphragm, which resembled a cystic kidney. In dissecting it out, which was accomplished with great difficulty, the left ureter was unfortunately injured. Five weeks later the left kidney was removed. The patient still had a small sinus in the perineum which discharged slightly.

type. The great majority of these pass through without disturbance, but occasionally serious trauma is inflicted.

Twice he had seen perforation caused by a piece of bone. Several years ago he operated upon a woman who had all the symptoms of acute appendicitis. When opened it was found that she had a perforation of the appendiceal tip due to a piece of chicken bone, which was hardly larger than one-half the size of an ordinary pin. Again, about a year ago he had an experience with a woman, age fifty-five, who had previously undergone a hysterectomy. Following this she had had an incisional hernia which was characterized by adhesions. She was suddenly taken ill with pain, local tenderness in the hernial sac and vomiting. At operation an irreducible hernia was found but not obstruction. Within the sac a piece of chicken bone over an inch long had perforated the gut with some local contamination. It was hoped she would get well, but as she was diabetic she died from coma in two or three days. There was no generalized peritonitis.

- (1) PERFORATED MECKEL'S DIVERTICULUM, (2) TWO INDEPENDENT SACS IN AN INGUINAL HERNIA,
- (3) REMOVAL OF PARAFFINE FROM IN-
- GUINAL CANAL IN CASE OF  
                INGUINAL HERNIA.

DR. A. BRUCE GILL reported the following cases from the service of Dr. Hodge at the Presbyterian Hospital:

CASE I.—A school-boy, aged thirteen years, admitted to the ward on the evening of March 4, 1913. For a week previous he had been having crampy pains about the umbilicus that occurred for the most part during the afternoon while the patient was in school. On the day of his admission about two o'clock in the afternoon while in school, he was seized with a sudden severe pain about the umbilicus and in the lower right part of the abdomen. He vomited repeatedly and was carried home from school.

On examination at ten o'clock P.M. there was present general abdominal rigidity which was most marked in the lower right quadrant. Pain and tenderness were chiefly in the same quadrant. The patient lay on his left side with the knees drawn up. On preparing the abdomen for operation a small red papule at the umbilicus bled slightly on being scrubbed.

The radiograph taken by Dr. Cole showed that the astragalus had been displaced, presenting its short axis in the line which should be occupied by the long axis. Dr. Gibney had seen the case in consultation and advised removal of the astragalus. When an incision had been made for the purpose, Dr. Morris found that he could not enucleate the astragalus because the entire joint was filled with fibrous and bony exudate. Consequently, he had removed a V-shaped wedge which included not only the astragalus, but parts of adjacent bones, and this allowed of correction of the talipes and the obtaining of a foot upon which the patient had been able to play a game of base ball recently.

## CÆCOSIGMOID ANASTOMOSIS.

DR. MORRIS presented a man, twenty-three years of age, who entered the Post-Graduate Hospital on January 16, with a history that 13 years ago he was operated upon for appendicitis with abscess through a right lumbar incision. Details of the case at that time not known. Eighteen months after the first operation, another abscess formed and was operated upon. This wound also closed in about a month. The patient remained well for five years and then had a third attack. At this time his appendix was removed and the wound was closed. Two years later, a fourth attack with abscess led his physicians to believe that the abscess had been a psoas abscess from the start. The last wound remained open for a year, and when it closed, the patient suffered at once, requiring another opening.

When he entered the Post-Graduate Hospital, on January 16, it was supposed that the abscess was connected with carious bone, for the reason that there was no history of escape of gas or bowel contents from the fistula, which was believed to be a sinus. A bismuth picture having been obtained, however, showed that there was indirect connection with the cæcum, intra-abdominal pressure making a sort of valve of the cæcum. The entire fistulous tract was laid open and an attempt made at closing the bowel opening. This failed. Dr. Morris then made a midline incision and found that the cæcum was of the mobile type, lying nearly in contact with the sigmoid. A cœcosigmoidostomy was done. This had relieved the patient from his distress and from his constipation. The site of the old sinus was at the present time filling with granulation.

and inward and fastened behind the rectus muscle. Upon examination of the cord a second hernial sac was found coming out of the internal ring. It was freed from adherent veins, opened, and found to be empty. The sac was excised and the stump disappeared into the abdomen. The operation was completed according to the Bassini method, but with the addition of one suture that fastened the edge of the rectus fascia to Poupart's ligament near the pubic spine, and a second suture external to the internal ring.

Recovery was uneventful. The patient was seen recently, which is more than a year since the operation. There has been no recurrence of the hernia, although he returned to his former work and has been doing heavy lifting.

CASE III.—Man, aged forty-eight years. He developed a right inguinal hernia seven years ago. Four years ago paraffine was injected at the side of the hernia by some person unknown. For eight months following this the hernia seemed cured, but at the end of that time it recurred and gradually increased in size. Several masses of paraffine could be felt beneath the skin and within the inguinal canal.

At operation one mass of paraffine was found imbedded in the aponeurosis of the external oblique in front of the canal, another lay beneath the skin above the canal, several pieces, including the largest, were within the canal. The vas was firmly adherent to three separate masses of paraffine and was dissected free with difficulty. The aponeurosis in front of the canal was dense and thick, and structures were obscured by the fibrous tissue about the masses of paraffine. The canal was exposed by splitting the external oblique above the canal and not in front of it and dissecting the lower flap downward. The largest piece of paraffine was near the internal ring, and its fibrous capsule was continuous with a mass of dense tissue that appeared to be an old obliterated sac. All the pieces of paraffine were removed.

A thin, wide-mouthed, empty sac was found posterior and internal to the cord and to the old obliterated sac. It was excised and its stump was transplanted upward and inward and fixed behind the rectus. The conjoined tendon and the edge of the rectus were sutured to Poupart's ligament in front of the cord. The upper flap of the aponeurosis of the external oblique

RESECTION OF ABDOMINAL WALL FOR TUMOR. 695  
PYLORIC ADHESIONS AND APPENDICITIS (KOENIG'S  
INCISION).

DR. MEYER presented a woman, forty-one years old, who was admitted to the German Hospital on April 25, 1912, with the history that for about four months she had suffered from pain in the abdomen. This was intermittent in character, beginning under the xiphoid cartilage and radiating toward the right. She had vomited occasionally, usually after meals. The vomitus had never contained blood.

Examination of the abdomen showed slight rigidity, without distention, most marked under the xiphoid cartilage, and in this area there was marked tenderness on pressure, which extended along the right free border of the ribs and was also present in the region of McBurney's point.

Operation, May 13, 1912: A semilunar (Koenig) incision was made across the upper border of the right rectus and linea alba, and the rectus muscle and sheath divided transversely. The gall-bladder was not distended, but there were rather broad and firm adhesions between the gall-bladder and stomach. These were divided between double ligatures. No sign of duodenal or gastric ulcer.

The appendix, which was directed upward behind the cæcum, was rather long, but neither congested nor swollen. It was attached to the mesentery of the cæcum. The appendix was removed, the wound closed, and the patient made a good recovery. She is well to-day. Dr. Meyer considers Koenig's incision, same as that recently recommended by Perthes, a step forward, inasmuch as both avoid the injury to the nerve branches of the right rectus muscle. A paresis or partial paralysis of the upper portion of the latter cannot set in as it sometimes occurs with the longitudinal division of the muscle, so much in use in gall-bladder surgery.

RESECTION OF THE ABDOMINAL WALL FOR RECURRENT  
TUMOR IN A HÆMOPHILIAC: PREVENTIVE INJECTION  
OF HUMAN BLOOD SERUM: RECONSTRUCTION OF  
ABDOMINAL WALL BY SILVER WIRE FILIGREE.

DR. MEYER presented a man, thirty-six years old, a cigar-maker by occupation, who was admitted to the German Hospital on January 7, 1913, with the history that about six years ago

## SUTURE OF THE HEART.

DR. ARTHUR E. BILLINGS reported the case of a man, thirty-one years old, who was brought to the Pennsylvania Hospital, at 2.55 A.M. on May 7, 1911, and was admitted to the service of Dr. Hutchinson, to whom the reporter was greatly indebted for the privilege of operating upon and reporting this case.

The patient's previous history was negative except for marked alcoholism for the last two years. Present condition: While walking through the east side of Franklin Square he was attacked by a man who stabbed him and fled. He was found by a policeman lying in an alley between Fifth and Sixth and between Race and Vine Streets, from where he was brought to the Pennsylvania Hospital by the patrol wagon. He was unconscious at the time of his admission, presenting the picture of extreme shock with hemorrhage. Temperature was 95°, breathing labored and sighing in character, radial pulse was imperceptible, and skin was clammy and cold. On examination of his thorax, there was a wound about 2 cm. in length in the midclavicular line of the left fifth interspace which was bleeding quite freely with respiratory movements. Percussion and auscultation revealed signs of a marked hæmopneumothorax. The heart sounds were irregular and distant, rapid, and at times almost inaudible.

*Operation.*—Local preparation consisted of shaving and the application of tincture of iodine to the field of operation. A semilunar incision was made over the left fourth and fifth ribs with the convexity toward the sternum. The fourth and fifth ribs were then severed near the costal border and turned outward about 5 cm. away from the sternal border forming a trap door. The left pleural cavity was filled with blood and the pericardium showed a wound about 1.5 cm. in length and was distended with blood. This opening was increased in length exposing the heart which revealed a wound in the left ventricle between 2 and 3 cm. in length on the external surface and slightly triangular in character, which was bleeding profusely with each systole, and was partially controlled by digital pressure during suturing.

This was closed with five interrupted sutures of No. 1 iodized catgut. The pericardium was closed with a continuous No. 1

account of the tumor of the liver. The case proves again the effectiveness of the injection of blood serum to overcome the dangers of an existing haemophilia.

#### ULCER OF THE DUODENUM: PYLORIC EXCLUSION.

DR. MEYER presented a woman, forty-two years old, who had suffered from gastric disturbance for a number of years. Medical treatment has been thoroughly tried without lasting result by Dr. Max Einhorn, who diagnosed duodenal ulcer. On November 13, before the Congress of American Surgeons at the Post-Graduate Hospital, the abdomen was opened and a distinct infiltrating ulceration found. The stomach was divided transversely, Huelt's wire-stitching instrument being used for suturing and placing a double row of wire staples for occlusion of either end at the same time; then both stumps were inverted by a single running suture of silk. Posterior gastro-enterostomy was then added. Convalescence was uninterrupted, with normal temperature from the beginning. To-day patient states to be materially benefited, though not yet entirely free from trouble.

#### ECHINOCOCCUS OF THE LIVER.

DR. MEYER presented a woman, twenty-eight years old, an Italian by birth, who was also operated on at the Post-Graduate Hospital. There was a large, bulging mass with smooth surface and evidently deep fluctuation below the right costal arch, passing upward and underneath the same, clearly a cystic tumor (echinococcus) of the liver. The abdomen was opened by a rectus incision. The wall of the cyst in the liver was calcified; there were quite a number of cyst-like irregular spots in the liver. After closure of the abdominal wound up to the liver and careful tamponade, the cyst was tapped and then incised. It contained typical clear echinococcus fluid and a great many daughter cysts of various size, with masses of coagulated material. The wall of the cyst was stitched to the parietal peritoneum and the large cavity amply drained. About twelve weeks after the operation the cyst's wall was discharged in one mass and it now seems that the patient will be cured. She is still at the hospital.

semilunar line corresponds to the incision of Kausch and certainly presents many advantages. He had one occasion himself, four years ago, to explore the cardiac orifice of the stomach and the spleen in a case of gunshot wound. The injury involved both the thorax and abdomen. He made first an incision in the line of the eighth left intercostal space, splitting the abdominal wall in a direction parallel to the nerves. Then the diaphragm was incised sufficiently to expose freely, after retraction of the eighth rib upward and the ninth rib downward, the region above the fundus of the stomach, including the spleen, the left lobe of the liver and the pancreas. Later the lung was exposed. He secured ample exposure by this incision, the abdominal portion of which corresponds to Kausch's, and to the horizontal limb of the incision advocated by Dr. Rodman and Dr. Willard; but unfortunately the patient did not recover.

DR. GEORGE P. MÜLLER reported the following case which he believed to be one of splenic anaemia. The history is as follows: A man, aged thirty, was awakened on the morning of August 26, 1912, by a feeling of nausea without pain. He then vomited a pint of blood and some hours later vomited again a lesser amount. Between the two vomitings he was treated by rest, ice, morphine and calcium lactate. He was sent to the University Hospital by his physician, Dr. Janvier, at about 7 p.m. The patient was a healthy baby until about two years of age, when he had some vague stomach or bowel trouble, accompanied by considerable pain and diarrhoea. This lasted for 3 or 4 weeks and he then recovered quite completely. During boyhood and up to the age of 18 years of age he was apparently well, although always of slim build and having a very white skin. Shortly after this time he had an attack of severe abdominal cramps with profuse diarrhoea after eating freely of oysters, ice cream and peaches. A few days later he had a similar attack and from this time on he has never been entirely well or free from pain and abdominal discomfort. The slightest indiscretion in diet brings on an acute attack of indigestion with abdominal pain and diarrhoea. About a year ago he had a severe attack of abdominal pain and diarrhoea associated with bladder trouble, jaundice, high fever and chills. He was in bed a week or ten days and became reduced in weight and strength. Has had no attack since then but has frequently had sick headaches occasionally associated with vom-

extending from the first to the fifth interspaces, both to the right and left of the median line, with marked pulsation, which could be seen and felt. The apical impulse was not palpable and the heart sounds were scarcely audible. But there was a loud bruit. A diagnosis of aortic aneurism was made, which the X-ray findings confirmed.

The patient was kept under observation on the medical division for several months, and was treated with mercurials and salvarsan, with very slight improvement in his symptoms. He still complained of pain, and suffered from cough and dyspnoea. On November 17, 1912, Dr. Meyer introduced into the aneurismal sac thirty-two feet of gold-platinum wire, through which an electrolytic current was then passed to hasten the formation of a clot. The technic followed was that described by Dr. William C. Lusk. Following this operation, there was marked and rapid improvement in the patient's symptoms, and he was discharged on January 12, 1913. A stereoradiographic examination made on the day prior to his discharge showed the wire in the aneurismal sac, with no perceptible change in the size of the latter. Having been bedridden before, he can now walk up four flights of stairs. Wassermann test being still four plus, further treatment with salvarsan is indicated.

#### INTRATHORACIC CARDIOPLASTY FOR INTRACTABLE CARDIOSPASM: SECONDARY THORACOTOMY.

DR. MEYER presented a man of forty-four, in good general condition, who had long suffered from intractable cardiospasm. He regularly regurgitated about two-thirds of each meal, and asked for operative relief. In May, 1911, bilateral vagolysis and single plication of the oesophageal fourth had been done, with rapid recovery and temporary marked improvement in swallowing. Gradually the former trouble had returned, very likely in part due to the scar formation around the lower portion of oesophagus and the cardia. Patient asked for further operative treatment in spite of possible dangers connected with such work, which were thoroughly explained to him.

On February 13, 1913, Dr. Meyer opened the thorax for the second time and did an intrathoracic cardioplasty. The left eighth and ninth ribs, together with the intercostal tissues, were excised, giving wide access. Then, with the tips of the fingers,

the sixth day after operation. Thirty-six hours after operation a blood count revealed haemoglobin, 40 per cent., and red blood corpuscles, 2,910,000. The fat in the wound showed signs of infection and four or five of the stitches were removed and several ounces of pus evacuated, after which the condition of the wound remained uneventful. At the end of the first week the patient began to pass considerable dark, foul-smelling material from the bowels, the passage of which was controlled by the administration of opium and resorcin. On September 3, seven days after operation, the blood count revealed a haemoglobin of 24 and red blood corpuscles of 4,470,000. It was evident that the black material coming from the bowel was due to intestinal bleeding and was not a residual of the stomach hemorrhage. More horse serum and certain other drugs were given, after a consultation with Drs. Stengel and Klaer, but made no impression on the patient who became delirious and died on September 9, thirteen days after the operation. No autopsy was allowed but the reporter had always believed this patient was suffering from splenic anaemia, caused by some intestinal toxæmia.

He was especially anxious to report this case because of the error in diagnosis which was made, that it was a case of haematemesis from gastric ulcer, based on the history of gastric distress followed by the vomiting of blood. At the time of operation a full history was not obtained but the diagnosis seemed clearly evident, especially in view of the fact that the patient was practically a total abstainer from alcohol and there was no evidence of syphilis or other disease of the liver. It was the intention to perform a splenectomy when the patient's condition permitted and the family were so informed at the close of operation, but the occasion never arose.

#### 105 CASES OF STRANGULATED HERNIA.

DR. EMORY G. ALEXANDER read a paper with the above title, for which see page 639.

#### FRACTURE OF CARPAL SCAPHOID AND CUNEIFORM WITH LUXATION OF SEMILUNAR; BLOODLESS REDUCTION; FUNCTIONAL RECOVERY.

DR. P. G. SKILLERN, JR., reported the history of a man, aged twenty-seven, who fell upon his hyperextended left hand. Ex-

ber of intervening walls broken through bluntly. Pus found; no hemorrhage; drainage. A year after operation the fistula closed. To-day patient is in splendid condition.

### THORACOPLASTY AND DELORME'S OPERATION FOR FISTULA FOLLOWING EMPYEMA.

DR. MEYER presented a boy, sixteen years old, who gave a history of pneumonia, with empyema, ten months ago. A resection of one rib was done, which resulted in a persistent fistula. The resulting cavity was repeatedly injected with bismuth, followed by bismuth poisoning and irregular fever.

The patient was seen by Dr. Meyer in December, 1912. After raising a skin-muscle flap, he excised a section of the chest wall involving five ribs. The pulmonary pleura was thin, and was peeled off, and a tamponade inserted. The patient made a good recovery, and was now in perfect health.

### THORACOPLASTY FOR CHRONIC EMPYEMA.

DR. MEYER presented a man, twenty-five years old, who gave a history of right-sided pneumonia two years ago. This was followed by an empyema for which he was operated on three times. There was an obstinate fistula near the spine, between the ninth and tenth ribs, and the probe and X-ray revealed a tube-like cavity adjacent to the spinal column and extending up to the second rib.

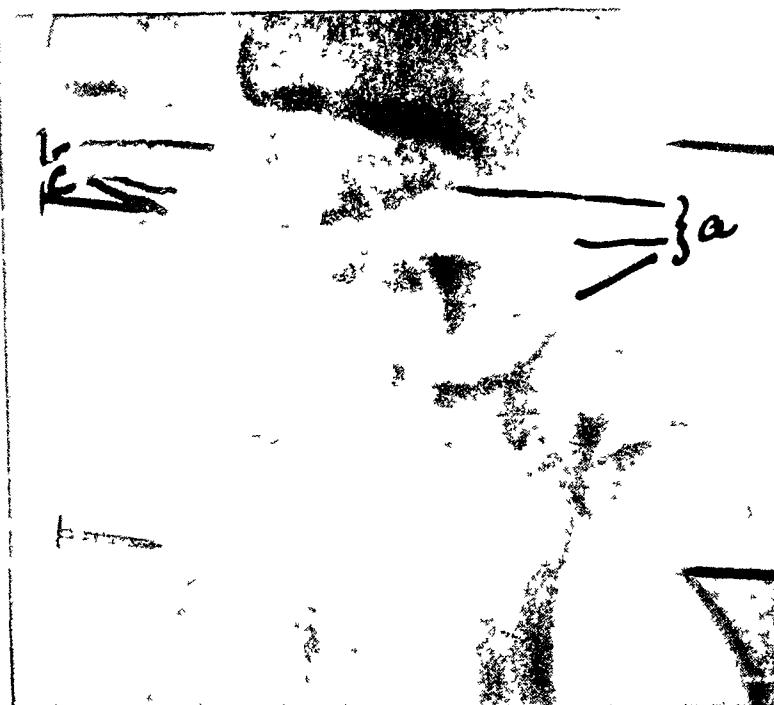
In March Schede's incision, scapula turned up, and second to fourth ribs inclusive resected in their posterior half. Good convalescence; still under treatment.

The X-ray plates of three last patients were exhibited.

### LIGATION OF BRANCHES OF THE RIGHT AND LEFT PULMONARY ARTERY FOR BRONCHIECTASIS.

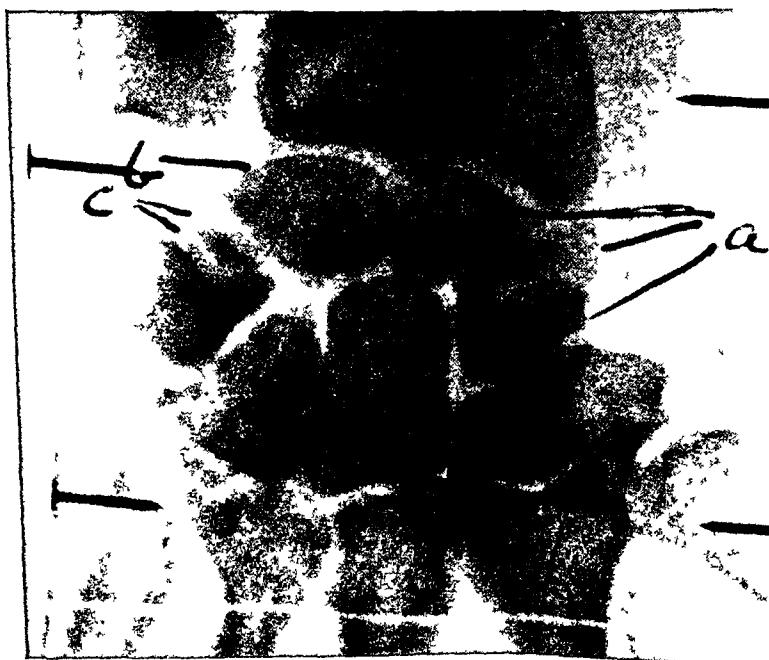
DR. MEYER showed three cases of bronchiectasis in which he had performed this operation under differential pressure (see ANNALS OF SURGERY, August, 1913, pages 197-200).

FIG. 3.



Anteroposterior view before reduction. Note *a*, tripartite fragmentation of scaphoid; *b*, displacement of semilunar; and *c*, fracture of cuneiform.

FIG. 4.



Anteroposterior view after reduction. Note *a*, improvement in position of scaphoid fragments; *b*, restoration of semilunar, and *c*, of fragment of cuneiform.

## ACUTE GASTRIC DILATATION.

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mouth were allowed twelve hours later without causing any disturbance.

Dr. Speese remarked that acute dilatation of the stomach may follow any variety of operation, although it appears to be relatively uncommon as a post-operative complication of hernia. Lyle (*N. Y. Med. Jour.*, 1911, xciv, 932) observed a case following the radical cure of a hernia, the operation was performed under local anaesthesia, and a large amount of omentum was resected. The dilatation began one hour after the operation, and in all probability was caused by the removal of the large amount of omentum which profoundly altered the circulation and possibly the nervous mechanism of the stomach, thus causing a temporary muscular paralysis.

The finding, at post-mortem, of constriction of the duodenum by the superior mesenteric artery at the point where it crosses the intestine, has naturally caused this factor to be regarded as of much importance in the etiology of the affection. That the constriction can be caused by an abnormally long mesentery or by ptosis seems unlikely, and is denied by Mathieu (*Arch. d. Mal. d' l'App. Dig.*, 1911, v, 409) who regards the gastric dilatation as the primary factor. Distention of the stomach must take place in a downward direction, the intestines are compressed, the superior mesenteric artery is put on a stretch and the duodenum is thus constricted. The primary dilatation is caused by aërophagia, which is the result of the constant swallowing which follows the nausea and pharyngeal irritation induced by ether. This view seems feasible in the case reported as the patient complained of annoying thirst soon after his recovery from the ether and the constant swallowing must have been accompanied by the passage of a considerable quantity of air into the stomach. The dryness and irritation of the pharyngeal mucosa were moreover increased by a chronic nasal obstruction which made mouth breathing a necessity.

DR. EDWARD B. HODGE said that recently, in the case of a woman, fifty-seven years of age, who developed pneumonia one week after operation for appendicitis, temperature was normal for two days, at which time she developed acute dilatation of the stomach; this was relieved after several lavages, but the patient finally succumbed to acute nephritis.

DR. GEORGE G. ROSS reported a case of dilatation of the

months previously in a street accident, and had been treated in another hospital for two weeks as a "bad sprain," skiagram taken at the time being declared negative. Since then the wrist was crippled, flexion and extension being very limited, and patient had pain in the joint on the slightest motion. Owing to the long lapse of time (seven months) since the injury, but one method of treatment was indicated, removal of the semilunar with both fragments of scaphoid. This was done, with relief of pain and increase of motion.

Fracture of the scaphoid with or without luxation of the semilunar is not a rare injury, and readily lends itself to clinical diagnosis by localized "wincing" tenderness in the snuff-box with, in case the semilunar be luxated, a distinct bony prominence in front of the carpus beneath the flexor tendons. This injury should be suspected with the same facility with which Colles' fracture is suspected and the same careful anatomical reduction should be made in order to avoid crippling of the wrist of a wage-earner and subsequent liability for damages which in such an instance seems glaringly justifiable.

scesses. The bacteriological examination of the pus showed *staphylococcus aureus*.

Instances of retroperitoneal abscess of this type are uncommon, and may cause considerable difficulty in diagnosis because of the symptoms suggesting an acute inflammation of the abdominal viscera. The origin of the abscess is not easy to explain. It seems rational to suppose that the primary process consisted in the formation of a haematoma, the result of the injury sustained. Subsequent infection occurred by bacteria derived either from the intestine or from the blood stream and abscess formation resulted. The same sequence has been observed in rupture of the liver or kidney, followed by hemorrhage into the retroperitoneal tissues.

Diffuse inflammation of the retroperitoneal tissues with pus formation may follow suppurative infections of the appendix, gall-bladder or pancreas. Sprengel (*Arch. Klin. Chir.*, 1912, c, 382) in a recent contribution has thoroughly reviewed the subject, and believes that the general peritoneal cavity in some instances may be uninvolved after appendicitis, for example, while a diffuse suppurative process may attack the retroperitoneal space. As a general rule the peritoneum acts as a barrier and prevents rupture of the pus into the abdominal cavity, but oedema of the mesentery and intestines, and a serous or blood-tinged effusion may result from the infection, and prove misleading when the abdomen is opened.

Sprengel refers to a case which resembles the one reported in many respects. The patient, a woman sixty years of age, sustained a fracture of the neck of the femur, and ten days later was seized with an attack of pain, vomiting and abdominal distension. The patient collapsed and death resulted on the eleventh day. The autopsy disclosed a suppurative para-proctitis which was regarded as the primary infection, and from this a fatal peritonitis arose. The rectal mucosa did not show any trace of injury from which the infection might have started.

The origin and formation of many of these infections is not clear. In children the diagnosis is difficult because of the possibility of an acute osteomyelitis of the femur, and because of the abdominal symptoms produced by pressure of the retroperitoneal effusion. That the disease is not so uncommon may be judged from the occurrence of this case, a second one a short time

Hospital, June 17, 1913. A double pyosalpinx, chronic appendicitis and extensive adhesions were found. No drainage used. Patient left the hospital on the eighteenth day and at the present writing (September 27, 1913) she has returned to her work.

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a needle. The intestinal wound was closed, examination of the surrounding coils of intestine did not reveal any evidence of perforation. The local peritonitis present was regarded as the result of a puncture of the intestine by the foreign body, the opening being small was soon closed by plastic lymph making its site difficult to discover. The abdomen was drained, convalescence was uninterrupted.

The patient when questioned was unable to remember that he had swallowed a piece of bone, but as he used alcohol to excess, it seemed likely that the accident occurred during one of his frequent debauches, from one of which he was recovering at the time of his admission to the hospital.

DR. GEORGE G. ROSS reported a case seen by him which was diagnosed as acute appendicitis; there was tenderness rather higher up than usual. At operation he found the appendix inflamed, but also noticed that on the outer wall of the cæcum there was a great deal more inflammatory lymph than on the inner. In pulling up the cæcum a tooth pick floated up into the wound and was removed. It seemed as if the tooth pick had gone through the ileocæcal valve and had pinned itself on the opposite wall of the cæcum and had ulcerated through.

DR. EDWARD B. HODGE said that he saw a patient last summer which resembled Dr. Speese's case very closely: A boy of four years came to the Children's Hospital. It was thought that he had appendicitis; he had the usual symptoms and had had two attacks previously of colicky pain which had been diagnosed as appendicitis by the family physician. Operation revealed some adhesions in the right iliac fossa and some free dirty fluid; no pus. Appendix looked all right. Further search detected a stricture of the ileum about one foot from the ileocæcal valve and a perforation above through which a piece of pickle was protruding. He did not think the pickle made the puncture but the boy had perforation and a very tight stricture. A resection was done and the patient eventually got well.

DR. MORRIS BOOTH MILLER raised the question of perforation from foreign bodies. This matter has never been definitely worked out, i.e., why certain objects cause perforation and others do not. All are familiar with the fact that children often have passed through their intestinal tract extraordinary substances, such as coins, pins, buttons and various materials of similar

pressure falls more rapidly; sudden deaths occur during its administration and are not infrequent at intervals after an apparently complete recovery from the anaesthesia. These late deaths are due to certain cell changes caused by the toxic action of chloroform. The longer a patient is kept completely narcotized by chloroform, the greater the immediate and later dangerous effects.

These observations gradually led to the substitution of ether for chloroform as the anaesthetic of choice. It must have been these dangers that were the paramount factors in the change, because ether is more difficult to administer, the time required to get the patient completely narcotized is longer; distressing complications, such as cyanosis and locking of the jaws during the administration, are more frequent; the after-effects of ether are more disagreeable than of chloroform; ether is more expensive than chloroform. In spite of these apparent disadvantages, ether won out, because careful observations demonstrated that it had real advantages on the side of safety. The administration of ether attained its highest perfection in the so-called drop method on an open cone.

Surgeons, however, were not satisfied and sought for other methods of anaesthesia which would eliminate even the discomforts and dangers of the perfected method. The dissatisfaction led to various forms of local, spinal, intravenous and rectal anaesthesia.

Convinced that the chief danger of ether was due to its toxicity and finding that many operations were impossible under local anaesthesia alone, surgeons continued their search for a general anaesthetic whose action would be less toxic, or not toxic at all.

Apparently nitrous oxide and oxygen up to the present time is the general anaesthetic with the least toxic effect. As a matter of fact we have no proof that it has any toxic action.

At first the nitrous oxide was employed without the oxygen, as an introductory to ether, simply to shorten the period of the anaesthetic time. It was soon found that it had no ad-

The mother stated later that he had bled from the umbilicus in infancy, and the patient himself had observed a red spot at the umbilicus that would bleed on irritation.

Operation was performed at 10.25 P.M. The abdomen was filled with bloody serum. The appendix was long and kinked, but not diseased. A Meckel's diverticulum was found coming from the ileum about two inches from the ileo-cæcal junction. It was about two inches long and as large as the middle finger. A cord three inches long extended from the end of the diverticulum to the umbilicus. The diverticulum was highly congested and was thickened. Near its base was an annular thickening and constriction. On the distal edge of the dense ring was a small perforation filled with a blood clot.

With the exception of enlarged glands in the transverse mesocolon there was no other evidence of abdominal disease.

The cord attached to the diverticulum was ligated and divided near the umbilicus. The diverticulum was excised and its stump was inverted by a purse-string suture reinforced by Lembert's sutures. The appendix was removed. The abdomen was freely flushed with hot salt solution and a drain was placed in the pelvis.

Recovery was uninterrupted and the patient was discharged on March 21, 1913.

CASE II.—Man, aged fifty-five years. Four years ago he suddenly developed a right inguinal hernia. He was stacking soap-boxes weighing 100 pounds each. While he had the seventh box above his head and was about to place it upon the pile, his right foot trod upon a potato and he slipped suddenly backward. The patient immediately felt a sharp nauseating pain in his right groin, and shortly afterward he noticed a soft swelling in the same region. The hernia has slowly increased in size to the present time. He has latterly worn a truss that did not restrain the hernia but did cause considerable pain. The hernia was reducible.

At operation a hernial opening large enough to admit the forefinger was found internal to the cord and one inch above the external ring. Protruding about two inches through the opening was a pouch of transversalis fascia which contained preperitoneal fat and a thin empty peritoneal sac. The sac was drawn down, ligated, and excised, and its stump was transposed upward

among the first, perhaps the first, to practise local anaesthesia, because it was safer.

When I began to investigate surgical shock and to critically review the literature (*Progressive Medicine*, December, 1899, p. 155) I read and reviewed the experimental work on surgical shock by George W. Crile (J. B. Lippincott Co., Philadelphia, 1898)—an essay awarded the Cartwright prize in 1897.

It is my opinion that we owe to Crile more than to any other writer our knowledge of the factors which produce shock, and of the early recognition, prevention and treatment of this definite surgical complication. In the sixteen years since his first publication Crile has continued his experimental investigations and has added to them great clinical experience. This has resulted in the development of a definite technic—a combination of local and general anaesthesia.

The paramount object of this new technic is to reduce the toxic action of the general anaesthetic and the traumatic factor of the operative manipulations to a minimum. The technic consists of general anaesthesia by nitrous oxid and oxygen, with little or no ether, and infiltration of all tissues divided or handled with 1:400 novocain.

This technic makes the operative time longer, puts more labor on the surgeon, requires infinite patience.

I am confident that it will never become popular until it is clearly demonstrated that it does reduce shock and operative mortality, post-operative discomforts and complications, and shortens the period of disability due to the operation.

For more than three years I have attempted to employ this method in every operation. In the majority of cases I have a complete record of the pulse and blood pressure before, during, and after the operation, with notes on the behavior of the patient in relation to the operative manipulations.

Fig. 1 represents the anaesthetic chart now employed. In the central column the pulse and blood pressure are recorded every five or ten minutes; the respirations are also recorded in their proper place. In the column to the right the one in

was also sutured to Poupart's ligament, and the lower flap overlapped it and was sutured above.

DR. ASTLEY P. C. ASHURST said that Dr. Gill's case of two sacs in an inguinal hernia reminded him of a similar sac found this winter while operating on a cadaver in the University. There were two sacs in the canal and extending down beyond the external ring; each had a separate opening into the peritoneal cavity at the internal ring. They were excised and sent to Dr. C. Y. White at the Episcopal Hospital for examination. He reported that both sacs were lined with endothelium apparently identical. The existence of adventitious bursæ which are not very rare in the wall of a hernial sac is easily explained, but he knew of no satisfactory explanation for two distinct sacs, unless both are congenital.

As regards Meckel's diverticulum, he had seen three cases. The first case was reported to the Academy some years ago. There was an internal hernia through a rent in the mesentery of the ileum. The patient was a child, aged twelve, and, as he had learned that if in children from thirteen to fifteen years of age, the umbilicus appears abnormal, one should suspect the existence of a Meckel's diverticulum, the opinion was hazarded before operation that this might be the origin of the obstruction. Only a month later he saw a man of forty-six years with symptoms of intestinal obstruction. He also had an abnormal umbilicus; four spots could be seen where the fetal structures had come through. In this case the diverticulum was found adherent to the umbilicus on the inside and twisted on itself. Unfortunately, the man died, in spite of relief of the obstruction. Another case of Meckel's diverticulum he saw in a patient with typhoid perforation. The perforation occurred in the ileum and in looking for more perforations he found a slightly inflamed but non-adherent diverticulum higher up. This patient, who was eighteen years of age, had an abnormal umbilicus.

DR. ADDINELL HEWSON said that recently, in his service at the hospital, a case came in with symptoms suggesting acute obstruction. Operation was performed and it was found that a Meckel's diverticulum was present and located about 2 feet from the ileocaecal valve, was twisted around the intestine and caused complete obstruction. This case was not in a young person, but in a man of mature age who made an uneventful recovery.

local infiltration. They are not familiar with the sensitiveness of the different tissues and the varying degrees of discomfort following different manipulations. It is my opinion that the first step in the development of this new technic is to perform as many operations as possible under local anæsthesia.

Under nitrous-oxid-and-oxygen general anæsthesia the patient as a rule moves when any very painful step is performed, but there is no such reaction to the less painful manipulations, so that if you begin with general and local anæsthesia, you will be aware only of the more severe traumas and you will by no means block all painful afferent sensations. And, as the patient only moves and does not cry out, the surgeon will naturally be less influenced. The mere introduction of 1:400 novocain here and there will by no means accomplish the result.

When the patient is anæsthetized with ether or chloroform, he does not move when painful manipulations are made, and many surgeons are of the belief that such painful stimuli do not produce the same effect upon the nerve cell as when the patient is awake. A careful study of the blood-pressure records during operation and post-operative convalescence will dispel this belief. General anæsthesia apparently obliterates only the psychic shock which would ensue if the patient were awake. We have no proof that traumatic shock from painful wound insults is reduced by general anæsthesia, and the evidence is rather in favor of the contrary.

Theoretically the entire field of operation should be so blocked by local anæsthesia that the brain cells receive no sensory impulses. This is not possible in all operations, and for this reason a general anæsthetic becomes necessary. If one could completely block these impulses, and eliminate the fear of the patient, a general anæsthetic would be superfluous. The endeavor of the surgeon, therefore, should be to reduce the sensory impulses from the wound to a minimum.

The difficulty of proving that the combined method of anæsthesia lowers mortality, reduces post-operative complications and discomforts and shortens the period of disability,

## SPLENIC ANÆMIA.

iodized catgut suture, without drainage. In the lower lobe of the left lung on its anterior surface, there was a ragged wound about 4 cm. in length which continued to bleed slowly and persistently. The sixth rib was then resected in the left midaxillary line and a small gauze pack was introduced to control bleeding from the lung. The trap door was then closed, the ribs being sutured in place with No. 5 iodized catgut and the skin closed with interrupted silkworm gut sutures without drainage. During the first part of the operation, an anaesthetic was not necessary, ether being used during the latter part of it. During the operation the patient received twenty-four ounces of normal salt solution, intravenously, and strychnine sulph., grains  $\frac{1}{20}$  hypodermically. After the operation the reaction was fairly prompt and surprisingly good. Pulse one hour after operation was 88 and temperature  $96.2^{\circ}$ .

During the following twelve hours, temperature reached  $102.2^{\circ}$ , soon dropping to normal with pulse ranging from 88 to 120, and the patient rational. Thirty-six hours after operation, patient's temperature began to go up, reaching  $101.1^{\circ}$ , pulse 120 to 140, with much respiratory distress and increasing cough with gradual circulatory failure. Death resulting about forty-eight hours after operation. Cardiac compression is suggested in this case because of the marked increase in bleeding after opening the pericardium and improvement in patient's condition at this time.

Autopsy revealed extensive pleurisy and complete solidification of the already collapsed left lung with slight pericarditis about the line of incision and wound.

SPLENIC ANÆMIA WITH SPECIAL REFERENCE TO  
ETIOLOGY AND SURGICAL TREATMENT.

DR. J. STEWART RODMAN and DR. DE FOREST WILLARD read a paper with the above title for which see page 601.  
 DR. ASTLEY P. C. ASHURST said that the incision in the abdominal wall described by Dr. Willard is very similar to that on the right side which has been employed for many years by Czerny for operations on the gall-bladder and bile-ducts. It has now been adopted by Kocher as his "normal incision" for difficult cases. The extension of the incision outward beyond the

one. Each surgeon must familiarize himself with his own results in the different groups of cases and then see whether there is improvement when the operations are performed under a combination of nitrous-oxid-and-oxygen general anaesthesia and local infiltration with 1:400 novocain.

This brings me to the most important point in my discussion. In order to perfect this method of combined anaesthesia, it must be employed in every case, and then, after a large number of observations have accumulated, the surgeon will be in position to compare the results.

Every patient must be looked upon as handicapped and extremely ill. Every operation must be considered a grave one. Every detail of technic should be carried out conscientiously.

Surgeons will find that this requires time. The surgeon will either have to work more hours in the day, or perform fewer operations.

In my own experience I have observed, first, a most distinct improvement in the post-operative convalescence. Pneumonia, thrombosis and phlebitis, gas pains and distention of the abdomen, acute dilatation of the stomach, anuria and nephritis have become distinctly less frequent. Now, as a matter of fact, the graver of these complications were not very frequent after good ether anaesthesia. It is only when one studies the smaller group of handicapped individuals and the graver operations, that the difference becomes more evident.

The lessening of the ordinary post-operative discomforts which cannot be looked upon as grave complications is the most evident feature of the method of anaesthesia here advocated.

The proof that the mortality is lessened after operations under the combined form of anaesthesia is most difficult to furnish. I am quite confident that resection of the colon and stomach for ptosis and its complications will prove much less dangerous when performed under the combined method of anaesthesia and that the results as regards post-operative

iting and also with pain in lower abdomen and with diarrhœa. After the attack 4 or 5 years ago he had a small hemorrhage from the bowel, but the diagnosis at that time was never definitely made, the condition being counted as a chronic enteritis. Patient is well built, rather fat, active mentally, and occupying a good clerical position. Upon examination shortly after admission the abdomen was flat without rigidity, masses or tenderness. The liver was not enlarged but the spleen seemed slightly so and was palpable one inch below the costal margin. Blood count made at the time revealed: Hæmoglobin, 67 per cent.; red blood corpuscles, 3,730,000, and a leucocytosis of 12,700, of which 81 per cent. were polynuclear. After his admission to the hospital he continued the line of treatment which Dr. Janvier had begun and in addition gave 20 c.c. of horse serum. At 10 p.m. he vomited 16 oz. of blood and, accordingly, it was thought that his stomach should be explored. Incision in right rectus close to the median line and extending from the ensiform to the umbilicus. Upon opening the abdomen the pale intestines and stomach presented nothing noteworthy and upon exposing and drawing the stomach into the wound, no evidence of ulcer could be detected, there being no points of thickening, scars, adhesions, no milk-white patches. The lymph nodes in the greater and lesser curvature were not enlarged. The liver was normal in appearance with thin, sharp edges. The gall-bladder was slightly distended but not abnormal. The spleen was large, measuring about 8 by 5 inches in size, quite firm to the touch and smooth. It was closely approximated to the fundus of the stomach. A small vertical incision was made in the stomach and considerable blood, both fluid and clots, evacuated. A small proctoscope was introduced and the stomach searched from one end to the other for ulcers, erosions or other evidence to show the origin of the hemorrhage. Absolutely nothing was found. In places the mucous membrane appeared congested but nowhere was there evidence of active bleeding. The wound in the stomach was closed with catgut and linen and the abdominal one with catgut and silkworm gut. Patient stood the operation fairly well, but was given 750 c.c. of normal saline solution intravenously at the close of operation.

Patient recovered fairly well from operation without much shock. Temperature gradually declined and reached normal on

upon many factors. As a rule the earlier the intervention, the better the results. I have attempted to show this in a previous communication (*The Medical Aspects of Surgical Diseases, or Preventive Surgery, Jour. of Amer. Med. Assc.*, March 23, 1912, Iviii, p. 829).

In conclusion we may sum up the question with the statement which apparently cannot be controverted, that there is a mortality, an increase in the number and severity of post-operative complications and discomforts, and a lengthened period of disability due to operative shock. The factors are psychic, due to fear; toxic and traumatic, due to the condition before operation; and psychic, toxic and traumatic, due to the operation itself. These factors may continue after operation.

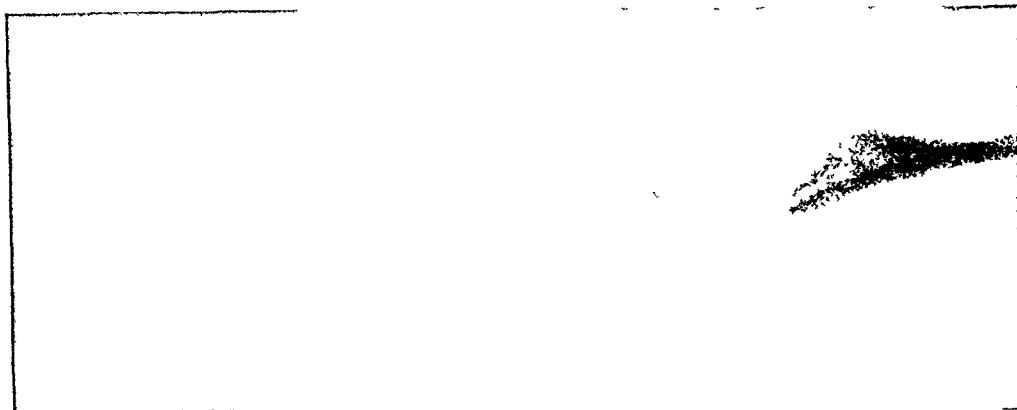
There is no question that we wish to improve our results, and to accomplish this, all factors must be borne in mind.

The absolute proof that the substitution of nitrous oxid and oxygen combined with local anaesthesia for ether alone, will rest at first upon a personal investigation by the individual surgeon. We have not yet reached the stage when comparisons with the results of different surgeons will be as helpful, because as yet it seems impossible to get at all the factors which enter into the problem.

To obtain the best results, every surgeon must attempt to improve all of his methods, to get his patients earlier, to study more carefully the preparation for operation, to improve his general and local anaesthesia, to improve his own technic, to study and make better his post-operative treatment. Then, and only then, will he observe and be able to estimate the factor of the toxic shock from ether and the traumatic shock due to operation without local infiltration.

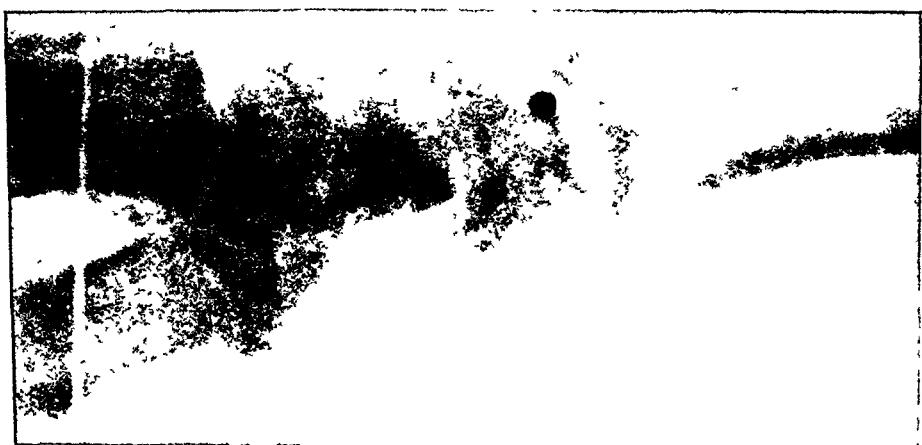
Fig. 1 is a chart made during the resection of the right half of the colon. The anaesthetic was gas and oxygen combined with local infiltration of 1:400 novocain; the full time of the operation was two hours and forty minutes. You will notice practically no change in the pulse or blood pressure; the patient's color was good throughout the operation. You will note that during the separation of the cæcum and colon,

FIG. 1.



Lateral view before reduction. Note displacement of semilunar anteriorly beneath os magnum; also, shortening of carpus by approximation of metacarpus to radius and ulna.

FIG. 2.

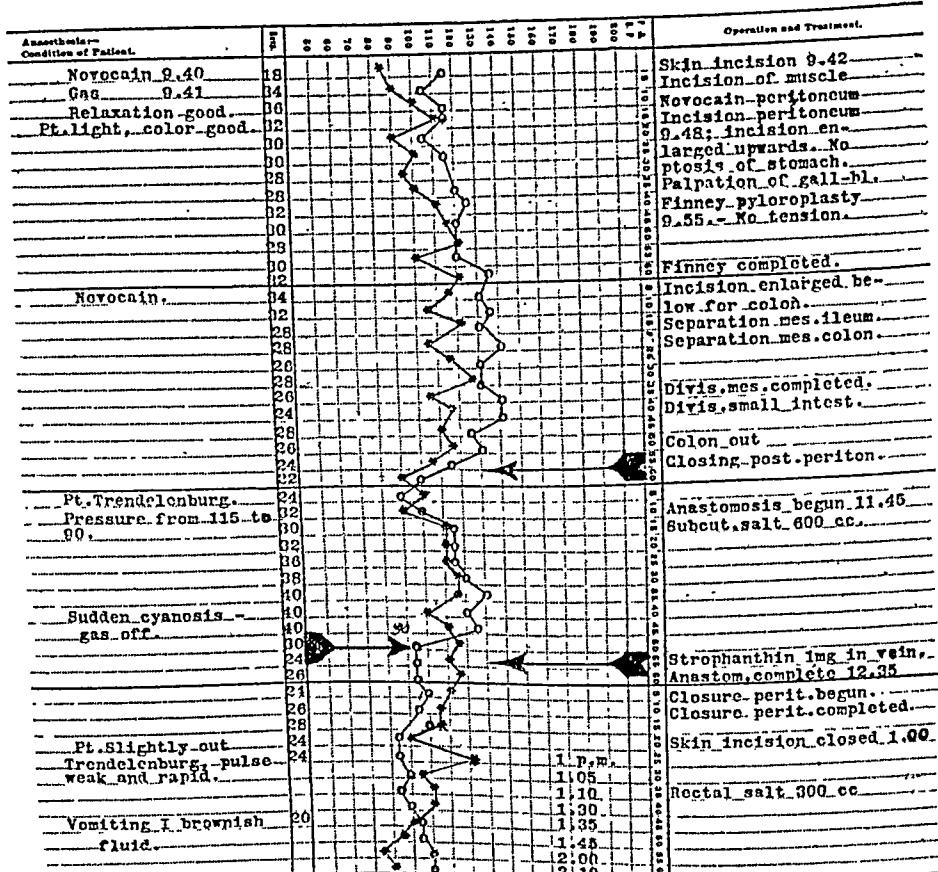


Lateral view after reduction. Note restoration of scaphoid to its normal position with consequent lengthening of carpus.

was as good as after an ordinary thirty-five-minute appendectomy performed under ether narcosis. I have discussed this lesion—chronic gastromesenteric ileus—in the *American Journal of Gastro-Enterology*, July, 1912.

Fig. 2. In this case the patient also suffered from a chronic gastromesenteric ileus; in addition there was pyloric stenosis due to a healed ulcer, requiring a Finney pyloroplasty in addition to the resection of the

FIG. 2.



right half of the colon. You will note that the operation required three hours and twenty minutes; no ether was given; the patient took the gas and oxygen well, and local infiltration with 1:400 novocain was employed throughout the operation. The general condition of this patient was not as good as in the previous case: she had been bed-ridden for nine months and had existed on practically only buttermilk. She was extremely emaciated, with quite marked secondary anaemia. The kidney function was good, and there was no cardiac lesion. You will note that during the Finney pyloroplasty, which was done with practically no tension, the pulse and blood pressure varied more than in the previous case

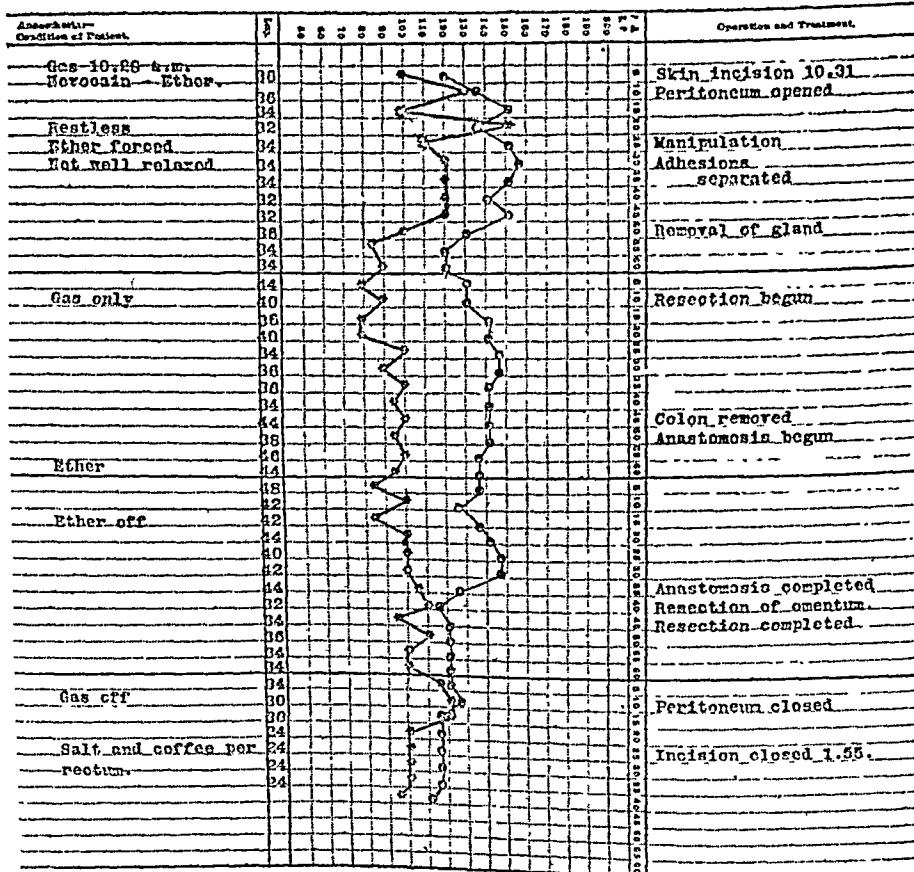
amination shows swelling around wrist-joint with tenderness in snuff-box and in front of carpus, and also a bony prominence in wrist beneath flexor tendons with shortening from tip of radial styloid to base of first metacarpal. Diagnosis of fracture of scaphoid with luxation of semilunar. Skiagram (Fig. 3) shows separation and displacement of scaphoid tuberosity between tip of radial styloid and trapezium; luxation of semilunar, and fracture of cuneiform. Lateral view (Fig. 1) shows displacement of semilunar into palm with rotation about its transverse axis, so that its concavity faces dorsally, and also a hollow on dorsum between posterior articular edge of radius and os magnum. The patient was immediately anaesthetized with nitrous oxid and manual reduction effected by the method described by Codman and Chase (*ANNALS OF SURGERY*, 1905, xli, 321, 863). Dressed on Bond splint. Skiagram (Fig. 2) now showed complete reduction of semilunar and (Fig. 4) improvement in position of fragments of scaphoid and cuneiform. After reduction the patient complained no longer of pain. Immobilization was maintained four weeks *without massage and without passive motion*. It must be remembered that this bone is but feebly capable of osteogenesis and is constantly bathed by the synovial fluid, the amount of which would only be increased by massage and passive motion, thus adding fuel to the fire. There being union at the end of four weeks, careful massage and passive motion rapidly restored complete function to the wrist-joint.

A similar case has been described by Corner (*Trans. Clin. Soc.*, London, 1905, xxxviii, p. 224) but the semilunar was fractured, in addition to being luxated, and the cuneiform showed fracture of the portion nearest the radius which damage, as Corner states, was obviously done by the lower end of the radius being forcibly driven on to the carpus. This was shown by close proximity of ulna to cuneiform. This injury was of eighteen month's duration, and had not been reduced. The patient complained that his hand was weak and occasionally painful, and that it had lost some of its power of movement.

The results of neglect or of improper management of this injury is further illustrated by an old case of undiagnosed and therefore unreduced fracture of scaphoid with luxation of semilunar recently described by the author (*Jour. A. M. A.*, 1913, ix, p. 1536). This patient had injured his right wrist seven

there are adhesions about the colon it is more difficult to remove it without pulling on the parietal peritoneum, and it is very difficult to infiltrate large areas of this peritoneum. In this case this was apparently done successfully. The fall of the blood pressure to about normal as shown in the chart took place after all painful manipulations had ceased. The operation in this instance must have been painful, because you will

FIG. 3.



observe that we had to give a little ether. Painful manipulations always at first increase the blood pressure. This patient, although in better general condition than the previous two, had a more uncomfortable convalescence which I attributed to the small amount of ether and the painful manipulations which we were unable to block. The details of this case will be discussed in a second paper already referred to.

I do not feel that I have as yet accomplished the utmost in the local infiltration of the posterior parietal peritoneum and mesentery in the operation for resection of the colon and stomach.

Fig. 4. This chart portrays three separate operations—each of these done entirely under local anaesthesia with novocain.

## CORRESPONDENCE.

### LATER HISTORY OF CASE IN WHICH TEN FEET EIGHT INCHES OF GUT WERE REMOVED.

#### EDITOR ANNALS OF SURGERY:

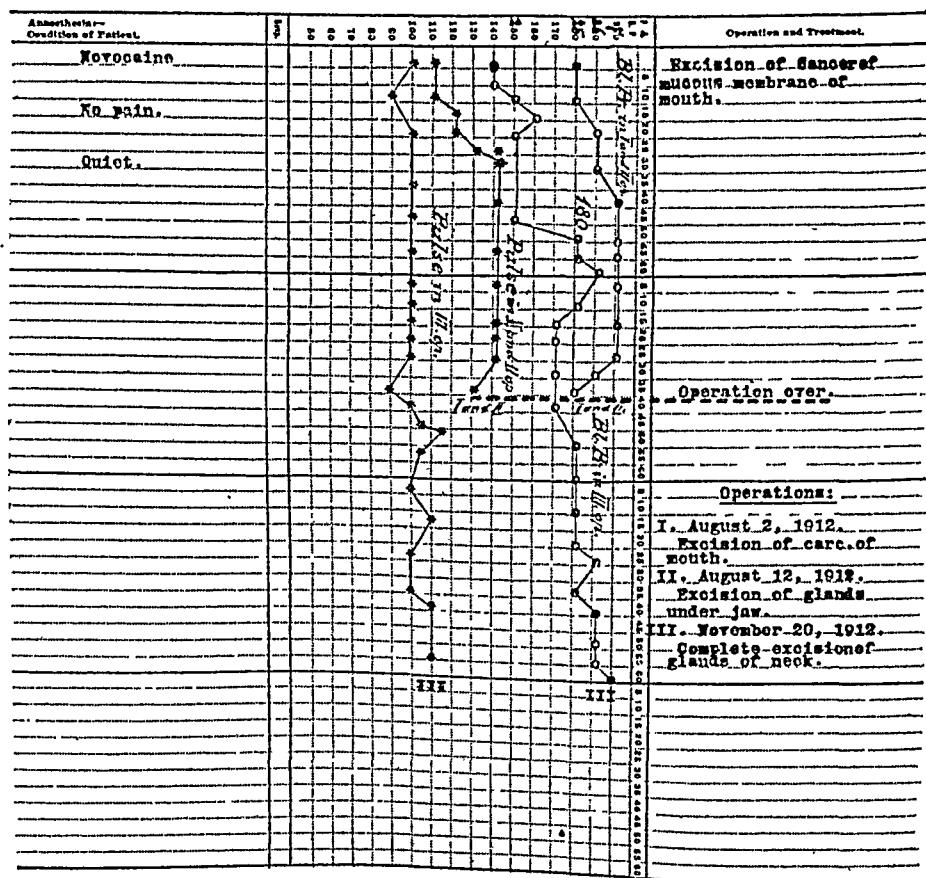
In the November issue of the *ANNALS OF SURGERY*, 1911, there appeared the history of a case which had been curetted by another physician for a macerated foetus; the uterus was perforated and the patient's gut torn from the mesentery necessitating the removal of ten feet eight inches of the ileum. This was July 10, 1911. In December of the same year she developed a peritonitis of obscure origin vaguely pointing to right tubo-ovarian inflammation with possible appendiceal involvement. She was treated expectantly for six days when an abscess pointed in the cul-de-sac. At this time she was exceedingly septic, having chills, sweats, typical "pump-handle" temperature (maximum 104.5° F.), a thready, intermittent pulse, 120-160. Under nitrous oxid her uterus was curetted and several pieces of fetal bone found; very fetid odor. The pelvic mass was drained through the vagina; she was placed upon Murphy treatment. Drainage was good for five days, though the pulse never dropped under 120°, when it was noticed that the abdominal scar was bulging. This was incised and a large amount of pus evacuated. Her symptoms gradually subsided and she was discharged in three weeks.

Patient remained well and gained several pounds in weight, but unfortunately contracted a double pneumonia in April, 1912, in which resolution was delayed until the 28th day, leading us to suspect a tuberculosis. Under forced feeding she regained the lost ground.

In May, 1913, she began having vague pains in the abdomen (especially on the right side) which progressively grew more severe. Gastric disturbances made their appearance; she ran a rapid pulse with slight elevation of temperature; had a profuse vaginal discharge. After absolute rest, use of ice-caps, restricted diet (the process apparently not being controlled), a supravaginal hysterectomy and appendectomy was done at the Woman's College

tion lasting four hours. The blood pressure in the first and last hour is not recorded, because the apparatus had to be used in another case. There was absolutely no post-operative shock, nor any complications. The record of the operation on the glands of the left side of the neck is complete—an identical operation with a similar result. The third operation consisted of the resection of the larynx performed without tracheotomy and with closure of the pharynx at the end. This operation was not absolutely painless, and you will note the fall in the blood pressure

FIG. 5.



after the third hour. The shock was slight, and the patient made an uncomplicated recovery. The only handicap in this case was the almost occluded larynx. For this reason I did not use a general anæsthetic.

Fig. 5 represents a composite chart of three operations under novocain alone. The handicap of this patient was a marked arteriosclerosis with high blood pressure, a crippled heart with marked dilatation of the aorta, albumen and casts in the urine, and a low kidney function. The pulse and blood pressure in the first two operations were so nearly alike that they are here recorded together. These operations required about

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## ORIGINAL MEMOIRS

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### STUDIES IN BLOOD PRESSURE BEFORE, DURING, AND AFTER OPERATIONS WITH REFERENCE TO THE EARLY RECOGNITION, PREVENTION AND TREATMENT OF SHOCK.\*

BY JOSEPH C. BLOODGOOD, M.D.,

OF BALTIMORE, MD.,

Associate in Surgery in Johns Hopkins University.

THE evidence available at the present time, while by no means sufficient to prove, is yet enough to indicate that we have made great advance in the early recognition, prevention and treatment of shock due to operative interference.

There are two factors in shock over which we have the greatest control—the toxic factor due to the anæsthesia, and the traumatic factor due to the operative manipulations. Our knowledge of these factors has been gained from experimental investigations on animals and careful clinical observations.

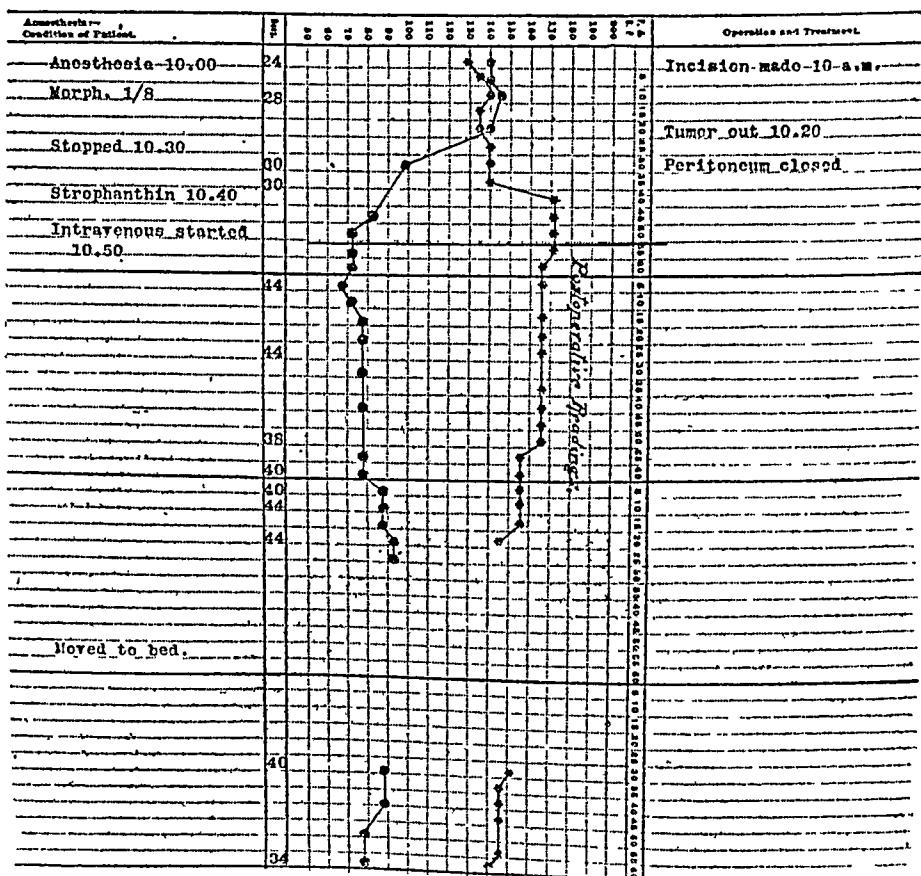
In the beginning of anæsthesia, chloroform was the anæsthetic of choice. It seemed to have advantages over ether—it was more easily administered, the patient became narcotized with less struggling, was more relaxed during the operation, and the post-operative discomforts were less. But it was soon found that chloroform has distinct dangers—it is more toxic than ether; during its administration the blood

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\* Read before the American Gynecological Association, Washington, D. C., May, 1913.

factors of safety are considered, in operations in the late stage of intestinal obstruction; in patients who have to be operated on while in shock after an injury; in the late stages of perforated gastric and duodenal ulcer, and in typhoid perforations; in resection of the stomach and colon for ptosis; in resection of the stomach for cancer and ulcer in patients

FIG. 6.



weakened from prolonged pyloric stenosis; in the radical operation for cancer of the uterus; in the combined abdominal and sacral operation for cancer of the rectum. I think I can also show that the mortality will be decreased when less formidable operations are performed on patients handicapped with lowered kidney function, with sepsis, especially cases of cholangitis and jaundice; patients suffering with diabetes and

vantage in reducing the amount of ether administered. Then attempts were made to perform longer operations under nitrous oxide alone, and these finally led to the combination of the gas with oxygen which permitted a longer anaesthesia with less cyanosis.

The combination of local anaesthesia with general, such as chloroform or ether, has long been employed. The object, however, of this combination was to reduce the amount of the general anaesthetic to a minimum. Those who employed it did not have in mind that the local infiltration was also of advantage in reducing traumatic shock due to local injury during the operative manipulations.

Operators, of course, have been familiar for a number of years with the fact that there is a definite factor in shock due to the cutting, tearing and handling of tissues during operations, but they seem to have devoted less attention to the reduction and elimination of this factor than to the toxic factor of the anaesthetic. They have been too prone to blame the anaesthetic for their operative and post-operative shock, its mortality and complications, rather than to place some of the odium on their own manipulations.

When I came to Dr. Halsted's clinic at the Johns Hopkins Hospital, in 1892, I found that he had very definite ideas of his own in regard to shock, different from those who had been my teachers in surgery and from the ideas I had gained from reading up to that time. He perhaps emphasized most the factor of hemorrhage, and his operations were more bloodless than any I had witnessed until then. He was also of the opinion that tissues should be handled gently—cut, not torn; that in clamping, the bleeding point only should be caught and not large masses of tissues crushed; that large wounds should be made, because through these the necessary manipulations could be more gentle. He evidently had in mind by these manipulations not only to reduce shock due to trauma, but the better healing of a wound in which the tissues were less injured. He also endeavored to operate with the least amount of ether possible. Dr. Halsted was

# TUMORS OF THE CAROTID BODY\*

BY JAMES G. CALLISON, M.D.,

OF NEW YORK,

Pathologist of the Manhattan Eye, Ear and Throat Hospital,

AND

JOHN EDMUND MACKENTY, M.D.,

Surgeon of the Manhattan Eye, Ear and Throat Hospital.

A BODY 5 millimetres long, 3 millimetres wide and 2.5 millimetres thick, lying in the bifurcation of the common carotid artery, of doubtful embryological derivation, of undetermined function, inconstantly present, but occasionally giving rise to tumors of a definite structure—that is the substance of our knowledge of this gland, so-called. Because of this uncertainty as to embryological derivation or physiological function, carotid body seems a better term to use than carotid gland.

*Anatomy.*—The carotid bodies are found in embryos of 20 to 30 millimetres long. They are variable in size, shape and position, and may be absent on one or both sides in embryo or adult. They increase in size as the individual grows, because of increase of connective tissue, blood-vessels and parenchyma. Reaching a certain size between 20 and 30 years, they remain stationary for a time and then the connective tissue only increases. The interlobular blood-vessels thicken, and sclerosis and atrophy results. The consistence of the carotid body varies, but usually it is moderately hard and elastic. In color it varies from a reddish-gray to a reddish-brown.

When present, the carotid body is found most commonly a little posteriorly to the bifurcation of the common carotid artery, lying between the internal and external carotids, and more closely united to one or the other of these. It is attached to the one on which it lies by the “ligament of Mayer,”

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\* Read before the New York Academy of Medicine, April 23, 1913.

charge of the anaesthetic chart notes from the dictation of the surgeon the various manipulations, for example: skin incision, peritoneum opened, mesentery pulled on, division of stomach, etc. In the left-hand column there is noted from dictation by the anaesthetist or by the surgeon the condition of the patient and any change in the method of administration of the anaesthetic, for example: gas started, infiltration with novocain; patient quiet; color good; patient cyanotic, moves, struggles; vomits; gas off; 20 drops of ether given; morphine hypodermically gr. 1/10; subcutaneous infusion of salt; strophantin intravenously, etc.

Thus we obtain a graphic record of the effect of the definite operative manipulations on the pulse, blood pressure, respirations and condition and conduct of the patient during the operation.

These will be discussed more in detail.

From my observations I am convinced that any operation performed under this method of anaesthesia, properly carried out, will result in less shock; the mortality will be lower; the post-operative discomforts and complications will be greatly reduced, the period of disability very much shortened. All this has certainly been accomplished in my own experience, and I think I have convinced my associates, both surgeons and nurses, that this method has great advantages over ether. I am also confident that no operating surgeon will come to the same conclusions until he has faithfully given this method a fair trial over a considerable period of time.

It is important, in the first place, to emphasize here that success depends perhaps most on your technic of local infiltration. No surgeon, who has not performed many operations under local anaesthesia only, will be able to get the same results from the combined method. When the patient is awake and you attempt an operation under local anaesthesia, you will always be informed when a painful act takes place, and you will be surprised at the difficulty of making such an operation perfectly painless. Very few surgeons in this country have educated themselves in the difficult technic of

carotica from the nerve anlage which passes from the upper cervical sympathetic ganglion between the two carotids. In a 44 millimetre pig embryo he finds in this plexus ganglion cells, some of which have a large and feebly staining nucleus, and believes that these latter cells represent the specific elements of the carotid gland. Up to this time only scattered observations have been made on the glandula intercarotica in man. R. Paltauf investigated an embryo of 15 millimetres and a foetus of 45 millimetres. In the former the gland had not yet appeared, but it was present in the latter. According to Kohn, the cells of the anlage of the gland in a 19 millimetre (N. L.) embryo resemble neither the small, deeply staining ganglion cells of the intercarotid plexus nor the chromaffin cells." McMurrich,<sup>3</sup> Bailey and Miller,<sup>4</sup> and Heisler,<sup>5</sup> agree with this view as to the derivation of the carotid body. Keith<sup>6</sup> does not definitely commit himself, but suggests a derivation from the sympathetic nervous system.

Of historical interest is the view, supported by Steide,<sup>7</sup> Rabl,<sup>8</sup> de Meuron<sup>9</sup> and others, that they are derived from the third or fourth branchial cleft; and the later view of Kastschenko,<sup>10</sup> Paltauf,<sup>11</sup> and Monckeberg<sup>12</sup> and others, that they are derived from the perithelium of the carotid arteries.

The above view of Zuckerkandl is strongly supported by Stilling's<sup>13</sup> demonstration of cells in the "cell balls" and in the stroma cells which stain brown with neutral salts of chromic acid. Kohn<sup>14</sup> confirmed Stilling's observation and calls these "chromaffin" cells. Similar cells are found in the medulla of the adrenal, in the pituitary and in the ganglia of the sympathetic nervous system. This group of structures, including the carotid bodies, is referred to as the "chromaffin" system.

*Physiology.*—As to the physiology of the carotid body there is but little positive knowledge. All investigations have proceeded along the line suggested by Stilling's demonstration of chromaffin cells in its substance. As the type of the chromaffin system, the suprarenal capsule, has to do with the regulation of blood pressure, as judged by its extract, the in-

is due to the fact that, in the first place, the records of many clinics are not sufficiently accurate and complete to allow a statistical study. In the second place, the mortality and other complications are relatively small for the majority of operations upon the average patient.

Even with rather bad ether narcosis and rough operative manipulations the mortality and other complications are not large when studied in the aggregate. With ether narcosis by the perfected method in the hands of an expert, and when the operation is performed by a skilled surgeon rapidly and without local anaesthesia, we have reason to believe that the mortality and complications are reduced.

The majority of surgeons apparently agree that, given the same operative skill and experience, the chances are better with ether as an anaesthetic than with chloroform, and still better when the ether is given by the perfected drop method and by an expert.

We must, therefore, compare this method of combined local and general anaesthesia with our results under the perfected ether method by a skilled anaesthetist, but without local anaesthesia.

For the ordinary operation upon the healthy individual the difference in mortality will be slight, but I am confident that a great difference will be found in the post-operative complications and discomforts and in the period of post-operative disability. The difference in the mortality from shock after grave operations upon healthy and upon handicapped individuals becomes very striking when these groups are studied separately. I am certain from my experience that the combined method of anaesthesia will reduce this mortality.

The mortality of simple and ordinary operations upon patients whose resistance before operation has been lowered by various factors, is by no means insignificant, and here I am also sure that the more difficult method of the combined anaesthesia will lower the mortality.

No statistics are available in the literature as to these facts. The investigation must at first be chiefly a personal

are limited to the tumors, of which 60 have been reported, including the one described at length in this paper, and four cases furnished by prominent New York surgeons. Gomez<sup>16</sup> observed some cases of sclerosis of the body, particularly in cases of arteriosclerosis, but this was not more marked than the change in the intima of the arteries in other locations. I have recently had an opportunity of observing a case of tumor of the carotid body occurring in the service of Dr. John Edmund MacKenty, at the Manhattan Eye, Ear and Throat Hospital, where the patient applied for relief from the throat symptoms. These observations and the study of the case form the basis of this paper.

*Clinical History.*—The patient, P. McD., male, Irish, driver, aged forty-one, presented himself at the clinic on January 14, 1913, for a tumor of the neck, with aphonia and difficult breathing, pain in the throat and difficult swallowing.

The family and past history were negative. The present illness began four months previously with loss of weight and increasing weakness. Six weeks previously he had noticed a hard tumor on the right side of the neck. The subjective symptoms had been noticed three weeks previously. In the four months he had lost twenty pounds in weight and had been compelled to give up work on account of weakness.

*Examination.*—Patient was a large robust man of 170 pounds. There was no marked evidence of cachexia. On the right side of the neck a hard tumor extended from the level of the angle of the jaw above to the clavicle below, and from the thyroid gland internally well into the posterior triangle. On palpation this tumor was board-like in hardness, there was no pulsation, and it was not movable in any direction, although the skin was freely movable over it. Auscultation over the tumor did not show any increase in the carotid bruit. Laryngeal examination showed paralysis of the right cord, and the larynx was displaced to the left. The chest was negative; pupils equal and reacted to light; no involvement of the facial nerve. The Wassermann and Noguchi reactions were negative.

He was sent to the hospital and a fragment of the tumor for diagnosis. In the laboratory this was divided into

mortality will improve very considerably. A study of fifty such cases of my own observation is in course of preparation and presents the available proof of my contention.

The various factors which enter into the question of estimating how to reduce mortality, post-operative complications and discomforts, and shorten the period of disability, are so numerous and each one so important, that it will not be out of place to mention them here. The mere substitution of nitrous oxid and oxygen for ether and the routine employment of local infiltration are by no means sufficient to alone accomplish the results hoped for.

The patient must be properly prepared—mentally and physically—for the operation. I have discussed this in a paper entitled: Estimation of the Vital Resistance of Patients with Reference to Possible Recovery after Surgical Intervention (*ANNALS OF SURGERY*, May, 1912).

The period of time between the onset of the disease and the operative relief is an important factor—in some cases the essential factor, and if this is not considered in the study of post-operative mortality, our conclusions may be misleading. For example, very early operations for intestinal obstruction under ether narcosis without local anaesthesia would probably show less mortality than late operations for the same condition under the most perfect combined local and gas anaesthesia. But my own statistics show that when we consider the cases of intestinal obstruction operated upon late, we will find that the mortality after ether narcosis is distinctly greater than after local anaesthesia alone, or combined local and gas anaesthesia. But even in this group another factor must be considered—whether enterostomy was performed or not. If the operator, with his improved method of anaesthesia, failed to perform enterostomy, while another with bad ether anaesthesia did, the latter's results would probably be better.

These examples show the importance of considering all the factors of safety when we attempt to get at the methods which yield the best results.

The condition of the patient before operation depends

ysis, and no lung complications. The patient did well until January 30, when erysipelas intervened, with wound infection. There was rapid sloughing of flaps, with destruction of tissue, and the patient continued to grow weaker. On February 8 there was a slight hemorrhage from the wound. On the 9th a more severe hemorrhage necessitated tight packing, and there was a continuous troublesome oozing. On the next day the patient was taken to the operating room to stop the bleeding, which now had become serious. When the packing was removed and the wound opened there was a violent hemorrhage. A finger was inserted into the bleeding point to stop the hemorrhage and it entered a hole in the common carotid. Ligatures were placed below and above the bleeding point. An intravenous infusion of 1000 c.c. of saline was given and the patient returned to the ward. The next day, February 11, the patient suffered from a left-sided paralysis, was comatose, and gradually weakened till death on February 13, three weeks after the operation.

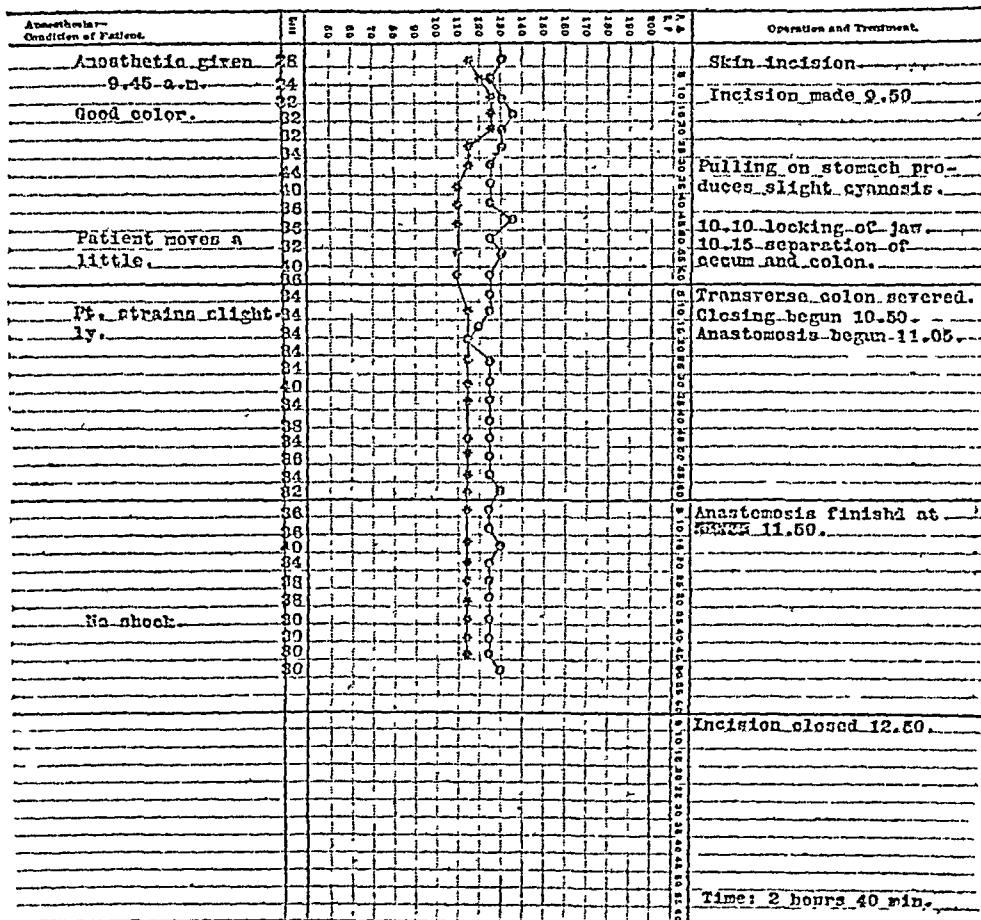
*Pathological Findings.*—The tissue sent to the laboratory was an irregular, torn mass half as large as a man's fist. In color it was red to reddish-gray. The torn surface presented a succession of lobules, appearing much like a mass of fish-roe. Extending over one side was a dense capsule, but no lobed appearance was visible. The specimen was hardened in formalin and alcohol, and embedded in celloidin and paraffin. Sections were stained with haematoxylin and eosin.

On microscopical examination the sections presented along one side a thick connective tissue capsule, with connective tissue bands extending from this into the depth of the tumor. These bands divided and subdivided, forming an alveolar structure. The connective tissue cells of these septa and of the capsule were long spindle-cells of sharp outline, with a lance-shaped, slightly vesicular nucleus. Scattered through these bands in groups were many younger connective tissue cells, without definite cell body, and with oval, vesicular nuclei.

The vascular supply of the tumor was abundant but anomalous. At no place were there well-formed blood-vessels, but the appearance was rather a succession of new formed blood spaces. Those running in the connective tissue stroma had a poorly defined vessel wall and were lined by irregular, jagged endothelial cells. Those in more intimate relationship with the alveolar part of the neoplasm presented only the endothelial lining, and the picture was the same as will be described in connection with the alveoli. Capillaries were present everywhere in the tumor, but were particularly abundant in those parts of the new growth which were richest in fibrous bands and septa. Many of the smaller

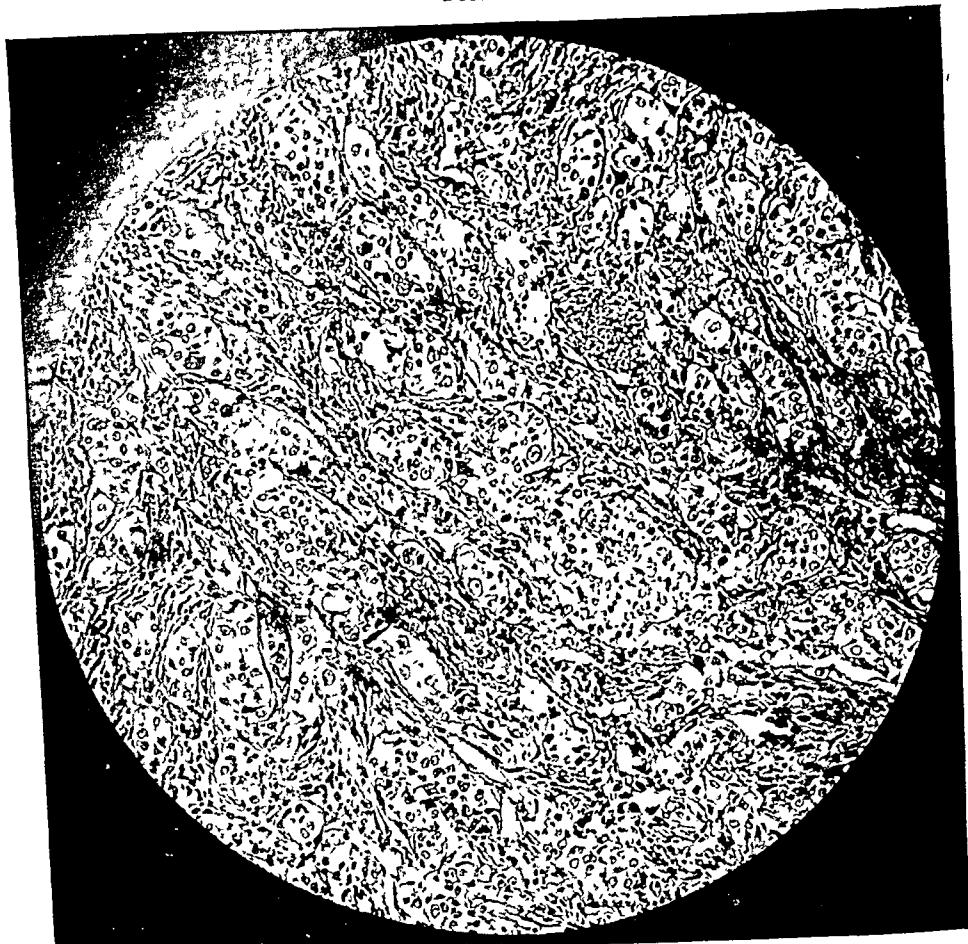
when some tension was put on the mesocolon, the patient moved a little and there was slight locking of the jaws; the blood pressure rose slightly. When the transverse colon was divided with the Paquelin cautery, some slight tension was again placed on the mesocolon, and the patient reacted in a similar way. With these two exceptions the patient was absolutely quiet throughout the operation. Not a drop of ether was given. From the behavior of the blood pressure and the patient we can

FIG. I.



be quite confident that no very painful manipulations were carried out. This patient had a greatly dilated duodenum due to a ptotic cæcum pulling on the mesentery of the small intestine because of the shortness of the mesentery of the ileum near the cæcum. She had been an invalid for seven years; gastric symptoms with vomiting had been present one year. She had lost weight, was anaemic, very nervous; the kidney function, however, was unimpaired, and there was no evidence of a cardiac lesion. Here, therefore, we have a grave operation performed upon a somewhat handicapped patient. Her condition at the end of the operation

FIG. 2.



Micropograph of tumor of the carotid body. Magnified 120 diameters.

during the first hour. This was due probably to the palpation of the gall-bladder and investigation of the condition of the pancreas and duodenum. You will note that in the second hour, during the entire time while the colon was being resected, the pulse and blood pressure showed but slight variations. Even these slight variations, as compared with those in the previous case, indicated to the operator that he was dealing with a patient with but slight factors of resistance. This is shown on the chart at the position of the first arrow. In closing the rent left in the peritoneum after the removal of the colon, one has to handle most sensitive tissues in an awkward position in the depth of the wound. Although this required but ten minutes, you will note that the blood pressure fell from 115 to 90. We then placed the patient in the Trendelenburg position and observed an immediate rise of blood pressure. During the anastomosis of the ileum and colon the blood pressure remained good, but just as we began to handle the wound for closure, the blood pressure fell again, and the patient was given 1 mg. of strophanthin into the vein. I have found that this drug is helpful to maintain blood pressure, and I give it when the blood pressure falls below 100 and there is no reaction after lowering the head and giving subcutaneous salt. You will note on the chart in this case that both of these measures of protection had been employed. Just previous to this last fall in the blood pressure the patient showed cyanosis, and for this reason the gas was immediately discontinued and the remainder of the operation performed under local anaesthesia alone.

We have, therefore, in this case at the end of the operation, a moderate degree of shock from which the patient gradually and completely recovered. When the operation was completed on this individual she was relieved of a great handicap—the pyloric stenosis, the duodenal dilatation, and the toxæmia from the right giant colon. She could take and retain nourishment almost immediately. There was no toxic substance, such as ether, to be eliminated. From my experience, I would not have attempted this operation under ether narcosis. I am confident that in this individual a rapid appendectomy under ether would have been more serious than the operation as performed, and her convalescence more uncomfortable. I look upon this case as an extreme test of the method.

Fig. 3. This chart was made during an operation upon a male patient in good general condition. The right half of the colon was resected because of post-operative adhesions secondary to appendectomy. The patient suffered from pain and partial intestinal obstruction. When

Previous to this Charles L. Scudder, of Boston, reported a case of tumor of the carotid body in 1903, and Funke and McPhatter each one in 1904. Keen and Funke collected 27 cases in the living and two cases which had been discovered at autopsy. I have been able to collect 31 additional cases, 28 cases in the living, one examined at autopsy, although known to exist before death, and two discovered at autopsy. These are, numbering consecutively with Keen's cases, as follows:

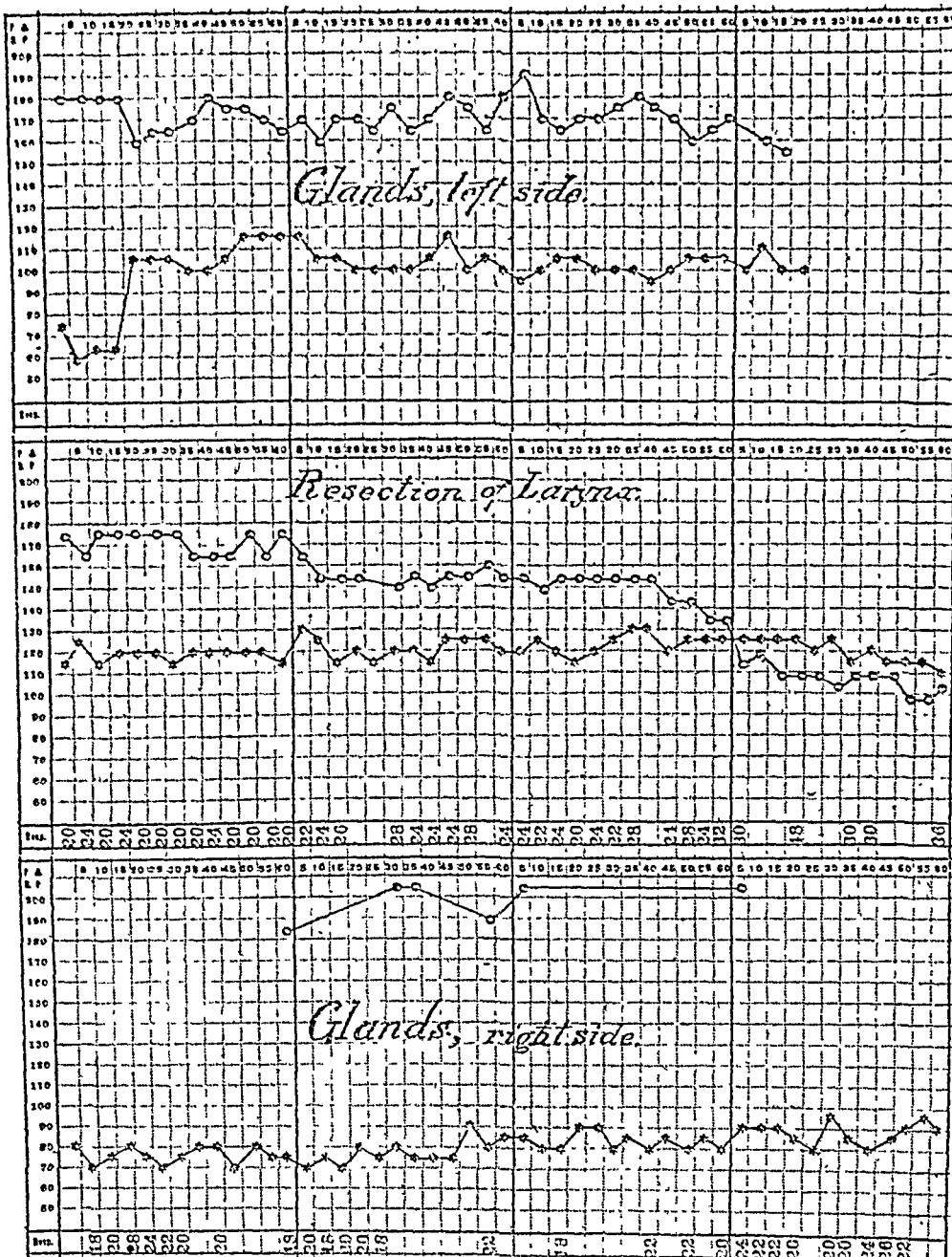
30. CECCA.<sup>18</sup>—The patient, a man forty years of age, about four years previously had begun to notice a small pulsating tumor in the right carotid region. This slowly attained the size of a hazel-nut. There was an autopsy, as the man died of pneumonia. The tumor was found to be inclosed in a thick fibrous capsule, lying at the bifurcation of the common carotid, and was closely connected with the common carotid by a vascularized pedicle. The microscopic examination showed the tumor to be a primary angiosarcoma, which had developed at the expense of the carotid body.

31. RIVET.<sup>19</sup>—A woman, forty-nine years old, seven years previously had first noticed a swelling the size of a hazel-nut, at the level of the jaw, behind the ascending ramus. It was not painful, but had recently grown to the size of a turkey's egg. The skin over it was movable, and the pulsations of the external carotid could be felt through it. At operation the tumor was dissected away from the carotid arteries. There was free hemorrhage, and after the operation there was aphonia and difficulty in swallowing. The removed tumor had the appearance of a goitre, but on consulting the literature it was identified as a tumor of the carotid body. The clinical diagnosis had been a parotid tumor or aberrant thyroid.

32. COOK.<sup>20</sup>—The patient, J. W., a mulatto, aged 29, had a slowly growing, painless lump on the side of his neck. This was a large mass extending from the tip of the mastoid to the level of the cricoid cartilage, and from the side of the thyroid gland to within 1.5 inches of the ligamentum nuchæ. The mass had a peculiar, elastic feel, was slightly compressible but not movable, and had a pulsation synchronous with the heart beat and expansile in all directions. A harsh bruit was heard over the left common carotid, beginning beneath the clavicle and extending to the tumor, while over the tumor a softer murmur was heard. At the operation hemorrhage was troublesome from the beginning, there being a constant oozing which could not be controlled with haemostats. The carotid arteries and internal jugular vein were ligated, but this did not control the hemorrhage. The patient died within an hour of the operation. The removed tumor was 7 x 5 centimetres in size. Only in places was there a definite capsule. It was dark red on the surface;

The patient was suffering from an advanced carcinoma of the larynx. The first operation consisted of the removal of the glands on the right

FIG. 4.



side of the neck with the sternocleidomastoid muscle and internal jugular vein. All the nerve trunks coming out between the muscles of the neck were blocked. You will note that it was a long and tedious opera-

the size of a lentil, on the intima. Upon the basis of the histological findings, the author proposes to designate this form of tumor as "struma of the carotid gland," or "struma intercarotica."

37. DOUGLAS.<sup>25</sup>—A. E., female, aged twenty-three years, American. The tumor was painless, but increased slowly in size. There were no symptoms until one week before operation, when hoarseness developed. He found a mass  $3.5 \times 2.5 \times 1.5$  centimetres on the right side of the neck at the anterior border of the sternomastoid muscle. This was firm, smooth and freely movable laterally but not vertically. The skin was freely movable over the tumor, it was not tender, and a slight transmitted pulsation could be felt. At operation this tumor was found in the bifurcation of the common carotid artery. The capsule, which was exceedingly vascular, was adherent to the sheaths of the vessels, but was removed without injuring them or any of the nerves. Paralysis of the left vocal cord followed the operation, but recovery was complete. The clinical diagnosis before operation was tuberculous cervical lymph gland. The pathological diagnosis, by Dr. Norris, of Bellevue Hospital, was perithelioma of the carotid body.

38. COLEY AND DOWNES.<sup>26</sup>—The patient, a man thirty-five years of age, four months before admission to the hospital noticed a swelling in the left sternomastoid muscle near its insertion. There was some difficulty in breathing while sleeping, and during the last two or three days there had been pain, in the muscle rather than in the tumor. Examination showed a tumor the size of an egg, on the left side of the neck, just internal to the angle of the jaw and apparently lying beneath the upper portion of the sternomastoid. It was smooth and symmetrical in outline, firm in consistence, and not tender. Examination of the pharynx showed a similar swelling on the left side nearly as large as the external tumor, pushing the tonsil and uvula over to the right side. At operation the external carotid and several branches were ligated. The tumor, exceedingly friable and matted to surrounding structures, was removed piecemeal, partly with a curette. The vessels were distorted, soft, and eroded. Recurrence took place promptly, and death occurred after four months. The removed tumor was of an alveolar type, and very malignant, causing death in eight months from the time it was first noticed.

39. COLEY.<sup>27</sup>—L. P. F., male, aged fifty-three, had a small tumor in the left parotid region for six years. This tumor, hard, painless, slightly movable, caused no inconvenience. As the tumor seemed to be getting larger and less movable, an operation for its removal was performed March 30, 1906. The deeply situated mass was enucleated, carrying with it the buccal branch of the facial nerve, which was entirely embedded in the growth. Paralysis of the buccinator and levator anguli oris occurred on the day following the operation, succeeded soon afterward by inability to close the left eye, and a little later by difficulty in pronouncing the letter "p." Later there was almost complete paralysis of the facial nerve and some branches of the fifth. The tumor recurred locally, followed by death in eight months with symptoms of brain involvement. Microscopically the tumor is described as a "a sarcoma of the mixed-cell variety.

one hour and forty-five minutes. You will note that in the third operation which required three hours, the pulse and blood pressure are lower. This may be explained from the fact that the patient, due to the rest and environment of the hospital had improved as far as his high blood pressure was concerned. The first operation consisted of the excision of a cancer of the mucous membrane of the cheek, the second of the removal of the glands under the left side of the jaw, the third of the removal of all the glands from mastoid to clavicle with the sternocleidomastoid and internal jugular vein.

Figs. 5 and 6 portray what is possible under local anaesthesia alone. Both patients had unusual self-control for local anaesthesia and desired to get along without a general anaesthetic because of the added danger.

My experience up to date with gas in high blood pressure has been most favorable, but not sufficient to test in this case (Fig. 6) if I could get along without it.

I shall reserve for a future communication the discussion of the apparent advantages of nitrous oxid and oxygen over ether in patients with high blood pressure.

Fig. 6. Here we have a graphic chart of shock due to trauma and loss of blood. This patient had a huge tumor beneath the psoas muscle in the left iliac fossa. It proved to be a benign fibromyxoma. He was taking 12 grains of morphine a day for pain when he came under my observation. I made up my mind to enucleate the tumor in stages, packing gauze between its capsule and the surrounding tissue. The chart was made at the last (tenth) operation. The final enucleation, you will note, required but twenty-five minutes. As the tumor was lifted from its bed there was profuse hemorrhage, and you will see the marked rise in the pulse and the fall in the blood pressure. Fortunately we were able to check the hemorrhage at once by packing. The patient recovered and is now well.

It seems unnecessary to reproduce here more charts. I look upon this paper as simply an introduction with the hope that it will influence you to try the method.

The final proof will rest upon a careful study of groups of operations of the same kind. These I propose to publish shortly. I feel convinced that I have sufficient evidence to prove that this method will be life-saving, if all the other

44. KUZNETSOFF.<sup>20</sup>—A female, aged forty-eight, had a right-sided tumor which had existed for two years, and which grew rapidly in the past six months. There was a swelling the size of a walnut in the course of the common carotid artery, which was movable laterally but not horizontally. She suffered occasionally from sticking pains. The patient was operated on in 1907. The external carotid was ligated, the tumor being dissected away from the other carotid arteries. The removed tumor was encapsulated, and was the size of a large plum. Recovery was complete without complications. The clinical diagnosis was between a cervical lymph adenitis and a tumor of the carotid gland.

45. LIGIN.<sup>21</sup>—Kuznetsoff refers to a case in which he assisted a Dr. Ligin to remove a tumor from a young soldier. It had been necessary to resect all the carotids. He classes it as a tumor of the carotid gland with recovery.

46. DOBROMISLOFF.<sup>22</sup>—A male, forty-one years old, had a left-sided tumor for 17 years, with rapid growth for one year. This tumor was in the superior carotid triangle. It was operated on in 1900 by Salisheff. All three carotids were ligated and removed. The internal jugular vein and pneumogastric nerve were cut. The tumor grew about the common carotid artery, and when removed it was egg-shaped,  $7 \times 5 \times 4$  centimetres in size, very firm, reddish-gray on section. It had been diagnosed as a tumor of the thyroid gland. Death occurred one day after operation.

47. DOBROMISLOFF.<sup>23</sup>—A female, aged twenty-five, had a tumor on the left side of her neck for seven years. Two years previously it had taken on rapid growth. It was located at the bifurcation of the common carotid, beneath the sternomastoid muscle, and extended up to within a finger's breadth of the lobe of the ear. The larynx was displaced to the right. There was transmitted but not expansile pulsation. Lateral movement was free, but vertical movements were restricted. At operation, in 1906, many veins were ligated and the arteries dissected out. While the posterior portion was being dissected hemorrhage was free. It was an encapsulated tumor  $9.5 \times 8$  centimetres. The patient recovered, but the left pupil remained dilated and the conjunctiva injected.

48. WOOLLEY and FEE.<sup>24</sup>—A woman, sixty-eight years old, had suffered from goitre five years. Two years ago she noticed a tumor on the right side of her neck. When examined it was 2.5 inches long by 1.5 inches wide. The larynx was pushed to the left. When the patient was examined on her back a bruit was heard over the tumor, but when her face was down this disappeared. There was a transmitted but not expansile pulsation. Vertical movement was free, but there was no horizontal movement, as the tumor was attached to the thyroid gland. The consistence was that of a large, non-pulsating lymph gland. At operation the tumor was removed, together with the bifurcation of the common carotid artery. The removed tumor was  $6.5 \times 3 \times 3$  centimetres and weighed 35 grammes. On microscopic examination there was distinct evidence of a sarcomatous change occurring in the tumor.

arteriosclerosis; high blood pressure from various causes; in the presence of pneumonia and bronchitis; in patients feeble with advanced age.

I have not, as yet, had sufficient experience with infants and young children. I feel that in these cases local infiltration should be employed, but we may find that ether given by the drop method is just as safe. Our limited experience with children is due to the fact that the number of cases is small, and we have not yet perfected the mask. My experience with operations under the combined anaesthesia on children between five and ten years of age is most satisfactory.

examination, an operation was decided on. The tumor was found lying on the anterior surface of the carotid arteries, involving the upper two-thirds of the common and a considerable distance along the internal and external. Paralysis of the right vocal cord followed the operation, although there had been no injury of the recurrent laryngeal nerve. From the histological examination the author calls the tumor an angiomyxoperithelioma.

53. BONI.<sup>3</sup>—A woman, thirty-four years of age, four years previously had first noticed the presence of a small swelling on the right side of the neck. This was the size of a small nut, was free from pain, spontaneously or elicited by pressure, and it was on a level with the angle of the jaw. Four months before coming under observation this tumor began to enlarge, became painful, and the patient became conscious of pulsation. On examination a soft, elastic tumor the size of an orange was found, pulsating synchronously with the carotid artery. It was somewhat reducible on pressure, but did not fluctuate. The location of the tumor in the bifurcation of the carotid, its intimate relation with the artery, the pulsations of which it transmitted, suggested a tumor of the carotid body. The tumor was removed by ligation of the common, external, and internal carotids, the jugular vein and pneumogastric and sympathetic nerves being dissected away from it. There were no post-operative sequelæ, and the patient remained well at the time of the report, two years after the operation. The histological examination suggested a fibrohaemangio-endothelioma. The author is in doubt as to the correct histological diagnosis, and leaves the question open as between a carotid perithelioma and a carotid adenoma.

54. MATHEWS.<sup>4</sup>—The patient, H., a male, twenty-five years old when first seen, was unable to definitely fix the appearance of a tumor on the left side of his neck, but thought there had always been a fulness there. The history, however, was quite definite of a growth for three years. In recent months there had been a modification of the voice. Examination showed a man in fairly good health. There was a swelling under the left sternomastoid muscle, which was ill defined and extended upward to the jaw and base of the skull and downward to the thyroid cartilage. Over this there was a bruit synchronous with the carotid pulsation. Pressure over the carotid suppressed the bruit, but did not reduce the size of the tumor. The left tonsil protruded to the median line, was smooth, not inflamed, and hard. The left side of the tongue was paralyzed and atrophied. Dr. Mathews attempted an operation at the General Memorial Hospital on May 9, 1911. The external jugular vein was ligated, and some pieces were removed from the mass, which infiltrated the surrounding tissue, leaving no definite outline to the tumor. Venous bleeding was profuse, although the internal jugular was about empty. As removal of the entire growth would have required extirpation of the common, internal and external carotids and the internal jugular vein, with all the important nerves of that side, and probably also the lateral wall of the pharynx, the wound was closed, leaving the tumor *in situ*. Primary union followed. This patient visited Dr. Duncan

through which it receives its blood supply. The body is surrounded by a dense fibrous (white and elastic) connective tissue capsule, from which prolongations are sent in, dividing the body into lobes, which are again subdivided into lobules. These delicate strands of connective tissue pass to the lobules and surround the "zell-ballen" of the Germans. These complete the alveolar arrangement of the structure, and are irregular groups of large, rounded or polyhedral cells, epithelioid in character, lying closely adjacent to the endothelial layer of the capillary tufts. They have a clear protoplasm, and contain large, round, well-stained nuclei. The afferent artery, running in the "ligament of Mayer," subdivides to pass to the lobes and lobules. Here it breaks up into a rich capillary network or tuft lying about and intimately associated with the "zell-ballen."

The nerve supply is abundant and is connected with both the cranial and sympathetic systems. It receives branches from the vagus and glossopharyngeal, superior laryngeal, and superior cervical sympathetic ganglion. Fibres pass from the vagus, glossopharyngeal and sympathetic to form a plexus in the angle of bifurcation just in front of the carotid body. Many fibres from this plexus penetrate the capsule of the organ. The capsule contains both medullated and non-medullated fibres, and these pass in freely to the glomerular tufts and "zell-ballen." Ganglion cells are scattered and few in number.

*Embryology.*—That the carotid bodies are derived from the sympatho-chromaffin system anlage, which buds off from the central nervous system in embryos of 20 to 30 millimetres, is the view expressed by Zuckerkandl.<sup>2</sup> He says: "The glandula intercarotica is associated with the plexus intercaroticus. That it belongs to the chromaffin system was recognized by H. Stilling. . . . Any attempt to derive this gland from a branchial pouch or from a thickening of the wall of a vessel must fail, since chromaffin cells can only be produced from sympatho-chromaffin tissue. . . . A. Kohn derives the chromaffin elements of the glandula inter-



vestigations into the function of the carotid body have been conducted along that line. Mulon,<sup>15</sup> in 1904, prepared a watery extract of the carotid bodies of horses. With this, by injecting it into the veins of rabbits, he was enabled to produce a rise of blood pressure, and sometimes an acceleration of the force and rate of the heart beat. Gomez,<sup>16</sup> working in 1907 and 1908, prepared a glycerin extract of carotid bodies. With this he produced a fall of blood pressure in cats.

Frugoni,<sup>17</sup> in 1911, 1912, and 1913, prepared an extract of carotid bodies of young sucking calves in Ringer's solution, 4 c.c. of which was equivalent to the carotid bodies of a calf. By injecting this into the veins of rabbits, he was able to certainly cause the death of a rabbit of medium size with 4 to 6 c.c. Death occurred in about five minutes, and the pre-lethal symptoms were inconstant convulsive seizures, respiratory paralysis, arrest of circulation, and hyperæmia of internal organs (anaphylaxis?). Intravenous injection of non-lethal doses caused a slight initial rise of blood pressure, followed by a fall of 20 to 30 millimetres of mercury. These phenomena are accompanied by feeble respiration and weak pulse. The same effects were obtained after severing the vagus and other depressor nerves. With isolated organs he was able to demonstrate a vasodilator effect. On the whole, he doubts the existence of an important internal secretion.

Its not constant presence, the contradictory results of experimental work, and the lack of clinical observation, indicate that the function, whatever it may be, is not important. However, the different parts of the chromaffin system, while of common embryology, possess different functions. Thus, the medulla of the adrenal affects blood pressure, the cortex has to do with the development of the sexual apparatus, the pituitary seems to exert a trophic influence, etc. These varying functions of the different parts of the chromaffin system, together with the fact that the carotid body atrophies at or soon after puberty and full body development, suggest that when its function is established it will be in some way connected with trophic stimuli in body development.

*Pathology.*—Pathological studies on the carotid bodies

she became alarmed. The diagnosis of tumor of the carotid body was made before the operation because of the hardness, the location, the long history, and because I had had the opportunity to examine a similar case, and afterward to operate on it, some years before. That patient died about two years after the operation of relapse with cachexia, but with no secondary or metastatic growths. The histological diagnosis, as in the present case, was made in the laboratory of Mt. Sinai Hospital. The tumor in my patient to-night was the size of an egg at the time of the first operation. There were firm adhesions to the internal jugular vein and to the carotid artery, so that it was necessary to ligate both of these vessels close to the clavicle, and using them and the freed tumor as tractors it was possible to shell out the pneumogastric nerve and ligate the internal and external carotid arteries and also the jugular vein in their upper portions. The day after the operation there was aphasia and well-marked right hemiplegia. The left eyeball was soft and its pupil contracted. In a few days all symptoms except the contraction of the pupil had disappeared. The pupillary contraction was probably due to injury of the superior cervical sympathetic ganglion. The aphasia was central. There was no aphonia. . . . DaCosta states that the apparent pulsation in these tumors is transmitted from the arteries. In the patient presented here to-night it appears to me that the tumor itself undoubtedly pulsates. I consider the case inoperable, and the patient now shows signs of cachexia."

58. GRAHAM.<sup>43</sup>—A male, age twenty-seven, was admitted to Lakeside Hospital, Cleveland, October 27, 1906, with a tumor on the right side of his neck that had existed for ten years. The tumor, not visible but palpable in its early stages, was free from pain and discomfort, and had been discovered accidentally. There had been severe headaches, the eye had been inflamed and the pupil irregular. During the six weeks previous to admission to the hospital the patient had suffered from sharp, shooting pains radiating to the left ear. At the operation, by Dr. Crile, a tumor  $5 \times 4 \times 3$  was removed by ligation of all the carotids. The recurrent laryngeal and the superior cervical sympathetic nerves were divided. The hypoglossal nerve was adherent to the tumor and was deflected from its course. During the operation there had been free bleeding, difficult to control, and at its conclusion the patient was suffering from severe shock. The next day the left pupil was contracted and the left eye paretic, and the patient suffered marked hoarseness. Weakness of the calf muscles and the arm developed after ten days, but recovery was complete. There has been no recurrence to date. Histological examination showed the growth to be a tumor of the carotid body.

59. GRAHAM.<sup>43</sup>—A male, aged twenty-seven, was admitted to the Lakeside Hospital March 12, 1913, with a diagnosis of tumor of the right tonsil. The tumor was known to have been present for seven years, and during that time it had not increased much in size. There was no pain and no difficulty in breathing or swallowing. The growth pushed far into the pharynx, reaching to the uvula. Externally it extended from the ear to the angle of the jaw, was smooth, round, and about the size of a small egg. It was slightly movable from side to side but not up and down. The right submaxillary glands were enlarged. Dr. Crile

two parts, one of which was hurried through the fixing solutions, the other being carried along slowly to secure more perfect fixation. The first part, cut into thick sections, showed a lymph node, much of which was normal or nearly so in structure. In places where the capsule was absent there was a definite infiltration of the surrounding fatty tissue with small, dense, closely packed round cells. From this appearance, and the definite, sarcoma-like tumor, a diagnosis of probable lymphosarcoma was made. The second piece, which was not sectioned until after operation, revealed a structure such as will be described below.

On the basis of this report the patient was readmitted to the hospital on January 23 for operation. The incision was carried along the anterior border of the sternomastoid from the angle of the jaw to the clavicle, and along the superior border of the clavicle to the trapezius. The skin, superficial and deep fascia, and the sternomastoid, were reflected in one flap. Raising this flap revealed a tumor extending from the upper border of the hyoid bone above down to and under the clavicle below. Anteriorly it was in contact with the thyroid gland, while posteriorly it extended to the transverse processes of the cervical vertebrae. Roughly the tumor was 14 centimetres long by 10 centimetres wide. The neoplasm was covered with a fibrous capsule. The surrounding tissue was adherent to the capsule, however, so that the line of demarcation was not sharp. It was lobular, dense, slightly elastic, friable. In color it was reddish-gray to red on section. An attempt was made to dissect it up from behind, but the growth was found to include the common carotid artery, internal jugular vein, pneumogastric and recurrent laryngeal nerves, and this attempt was abandoned. An incision was then made in the course of the common carotid artery and down to the artery and sheath, and an attempt was made to dissect the mass away from these structures. The neoplasm was so firmly adherent, however, that this was impossible. The portion of the tumor anterior to the vessels was then dissected away; hemorrhage, which had been free and troublesome, but not dangerous, was checked, drainage inserted and the wound closed. The exposed common carotid was irregularly eroded and had the appearance of a badly rusted iron pipe.

Recovery from the anaesthesia and post-operative shock was rapid and complete. There was no increase of laryngeal paral-

four the voice has been affected, and there has been more or less dysphagia. In one there has been such tracheal irritation as to produce a constant cough. In five the tongue has deviated to one side. In four there has been an altered pupil, in one conjunctival injection. In four cases the face has been partly paralyzed.

*Etiology.*—The etiology of tumors of the carotid body is wrapped in the same obscurity that envelops the causation of other neoplasia. A study of the ages of reported cases seems to offer some justification for von Heinleth's<sup>34</sup> observation that the carotid body reaches full development between 20 and 30, and then either atrophies or goes on to tumor formation. These ages, by decades, are: Up to 20 years, 3 cases; 21 to 30 years, 13; 31 to 40, 12; 41 to 50, 14; 51 to 60, 10; over 61, 5. In three cases the age is not stated. It is thus seen that in 57 cases in which the age is given, 39 occurred between the ages of 20 and 50. This is accentuated by a study of the duration of the cases. In the younger individuals, the duration is short, while in older persons the duration is of much greater length, 17 years in cases 39 and 45. The sexes are equally affected—31 males and 28 females, with the sex not stated in one case.

*The Nature of the Growth.*—These tumors usually have a long history of slow growth. During this period they may manifest the characteristics of a benign neoplasm. They are encapsulated, do not invade the surrounding tissues, do not return if completely removed, and give rise to no symptoms other than the deformity. Complete removal is, of course, difficult on account of their location. Later they may take on rapid growth and assume the characteristics of a mildly malignant tumor, recurrences and metastases being reported, but the cachexia and anæmia of a malignant growth are not present. Considering this history, and on the histological structure, Beitzke, in his case, and Kocher, in the case reported by Licini, designate the condition as a "struma." Their uniform classification in one of the tumor groups is not possible because of the varying structure of the tumor in some of

FIG. 1.



Composite drawing of typical fields of the tumor. *A*, blood space in intimate relationship with the cells of the alveoli; *B*, embryological remnant of gland; *C*, newly formed connective tissue cells making up the trabeculae; *D*, vesicular cells filling the alveoli.

from the size of a robin's egg to one that can just be palpated. It is underneath the sternomastoid, or at its anterior margin, on a level with the upper border of the thyroid cartilage. It is egg-shaped, single, discrete, firm, elastic, movable laterally but not vertically. There is a pulsation, transmitted but not expansile. A stethoscope placed over the tumor will reveal a distinct bruit in most cases. As the tumor progresses the picture changes, and more and more structures are involved. Perhaps the most constant of the later symptoms is the paralysis due to involvement of the recurrent laryngeal while its fibres are still within the vagus. These reveal themselves as paralyses of the cords and other laryngeal and pharyngeal muscles, leading to difficult phonation and deglutition. The larynx may be congested and catarrhal. The pupils may be irregular and fail to react to light on the affected side. When the tumor becomes more extensive and invades surrounding structures its mobility may be distinctly less. At this stage the larynx may be pushed to one side, or the tumor may bulge into the pharynx.

*Differential Diagnosis.*—The first difficulty in the way of making a diagnosis of tumors of the carotid body is their rarity. Were they more common the diagnosis would be comparatively easy. But when one is encountered its true nature is not suspected. Seven have been recognized before operation. These were by Reclus and Chevassu, Kopfstein and Maydl, Da Costa (two), Kocher in the case reported by Licini, Boni, and by Lilienthal in his second case. Kuznetsoff narrowed his tumor to a lymph adenitis or a tumor of the carotid body. Keen thinks he would recognize another one if it should come under his observation.

Tumors of the carotid body must be differentiated from cervical lymph adenitis, early metastatic carcinoma of the lymph glands, sarcoma, particularly lymphosarcoma and sarcoma of the lymph glands, lipoma, fibroma, aneurism, branchial cyst, gumma, Hodgkin's disease, aberrant thyroid and Bezold's perforation of the mastoid. It is only when these conditions occur in the superior carotid triangle that a differentiation must be made.

blood spaces and capillaries had only a thin membrane between the lumen and the cellular elements.

The alveolar arrangement varied in different parts of the tumor. In places near the capsule the alveolar structure was regular and definite, while in older parts of the neoplasm this shaded off to a more diffuse, sarcomatous appearance. Some of the cell groups were round or irregular in shape, while others appeared as columns of cells. But always, due allowance being made for the variations present in malignant growths, the structure was the same. The relationship between the tumor cells proper and stroma was definite and intimate, fibrils seeming to pass from the stroma between the cells of the alveoli, and in places fibrils seemed to pass out from these to join the stroma. The cells in the alveoli were large and irregularly polyhedral. The centrally placed nucleus filled but a small part of the cell. The nucleus was round or oval in shape, was vesicular, possessed a prominent nuclear membrane and a well-marked nucleolus. About this was a fibrillar network of protoplasm. From the angles of these polyhedral cells fibrils seemed to pass between adjoining cells and into the stroma. The size of these cells varied, but not more so than is usual in rapidly growing neoplasia. Evidences of mitosis were present in both stroma and the enclosed cell groups, but more frequent in the latter. Some of the alveoli seemed to be grouped about or were intimately related to the blood spaces. In such places there was a layer of intimal cells. Outside of this were one or two layers of smaller spindle-shaped to polyhedral cells and then the alveolar cell nests. Within and between the cells of the alveoli were many vacuole-like spaces. Those within the cells were doubtless artefacts of fixation, but those between the cells present some evidence of being blood spaces. Monckeberg pictures them as such, but I think in my preparations the evidence was not conclusive. Whether his sections presented clearer pictures of this than my own, I am unable to say.

Occasionally, there were small areas of the tumor resembling the embryological carotid body. These consisted of wide blood spaces without walls, within which were columns of polyhedral cells. These resembled in structure the columns of cells and blood spaces of the liver, except that in proportion to the cells the blood spaces were much wider.

On the whole, the appearance was that of an endothelioma, but in places the structure was that of a loose sarcoma. The sections were variously diagnosed by competent men as carcinoma, sarcoma, endothelial sarcoma and endothelioma. This latter agreed with my own opinion, but I was never quite satisfied. When I took sections to Prof. James Ewing, of Cornell University Medical College, he suggested a tumor of the carotid body. Comparison of the structure of the tumor in this case with other reported tumors of the carotid body convinced me of the correctness of this diagnosis.

*The Literature.*—American literature on the carotid body begins with the careful paper by Keen and Funke<sup>1</sup> in 1906.

mass, and there is usually other evidence of syphilis. The Wassermann and Noguchi reactions will aid in the diagnosis, when positive, or a therapeutic test may establish the nature of the swelling.

Aneurism gives rise to an expansile pulsation, the pulse on the affected side is delayed in the temporal arteries, and there is a gurgling murmur over the tumor.

Kopfstein excludes aberrant thyroid by the absence of an enlarged thyroid gland. Reclus says he has never seen aberrant thyroid gland as high as the thyroid cartilage.

The differential diagnosis, hard as it is on paper, is yet more difficult in actual practice. After the surgeon has exhausted every diagnostic means at his command, he will still be in doubt as to the nature of the tumor he is considering. It then becomes necessary to remove a fragment of tissue for pathological diagnosis, or to proceed in ignorance of the nature of the growth with which he is dealing.

*Surgery.*—The detailed surgical treatment of tumors of the carotid body is beyond the proper bounds of this paper. Yet some suggestions from a pathological viewpoint may not be amiss. The history of this tumor shows it to be, in its early stages, a benign tumor, which later takes on a malignant growth. The surgical treatment, therefore, for purposes of consideration, can be divided into two cases. A diagnosis is rarely made in the early, benign stage, but an operation is attempted under some mistaken diagnosis, and then the true nature of the tumor is discovered. If now the tumor is not closely adherent to the arteries, except through the "ligament of Mayer," it seems safe to dissect it away from the bifurcation. Keen advises against this, but I can see no objection if a close watch is kept for recurrence and then such further operative procedures taken as the case may demand. On the other hand, if the tumor surrounds the arteries, is closely adherent to the wall, and other structures are included in the surface of the growth, then an attempt to dissect away the mass must be condemned. Five recurrences out of fifteen in which this has been attempted argue strongly against it.

## TUMORS OF THE CAROTID BODY.

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on section, pearl gray tinged with red. The clinical diagnosis was probable carotid aneurism.

33. CATHCART.<sup>21</sup>—The patient, a white male, aged thirty-three, was operated on two years before the case was reported. When first seen there was a firm, movable tumor on the left side of the neck the size of a pigeon's egg, but two months later this had increased to the size of a hen's egg. This mass was not tender and he complained of no pain. There was some interference with swallowing, and he was deaf on the left side. At the operation there was free bleeding from the whole exposed surface, and as this could not be controlled it was found necessary to ligate the common, internal and external carotids. This new growth extended from half an inch below the bifurcation to two inches above, and surrounded all three arteries. The tumor and arterioles were removed intact. As the jugular vein and pneumogastric nerve were not involved these were not injured. There was a well developed fibrous capsule sending septa within the structure, dividing it into alveoli-like spaces. There was no recurrence in two years. No diagnosis was made previous to operation.

34. ZONDEK.<sup>22</sup>—In the case of a man sixty-three years of age a tumor had been noticed for nine years. It was on the right side of the neck at the level of the larynx. The swelling, which surrounded the common carotid at its bifurcation, gave rise to no symptoms, aside from a slight sensation of pressure. At operation the carotids were all ligated and cut. The patient made a good recovery, and was discharged three weeks after operation.

35. LICINI.<sup>23</sup>—A man, aged twenty-eight, had a tumor on the right side of his neck for nine years. After the tumor had existed for five years, under the impression that it was an enlarged gland, the pulsating mass was incised. There was free hemorrhage and a diagnosis of angioma was made. As the tumor continued to grow, and caused pain and dysphagia, the patient travelled from his home in Brazil, to Kocher, in Berne, Switzerland, to be operated on. On the basis of its location in the bifurcation of the common carotid artery, which could be traced through the tumor by palpation, and on the pulsation and elasticity, Kocher made a diagnosis of tumor of the carotid body. A tumor the size of a hen's egg was dissected out of the angle of bifurcation, which had been much widened by its growth. It was bluish in color and had the appearance of a soft sarcoma. The patient made a good recovery. On the basis of the histological findings it was called a "struma" of the intercarotid gland.

36. BEITZKE.<sup>24</sup>—This case of tumor of the carotid body was found accidentally at the autopsy of a woman fifty-six years of age. It had caused no symptoms during life, and the woman's death was due to severe general pemphigus complicated by pneumonia. A brownish-red tumor the size of a plum, of moderately solid consistence, was found in the angle of bifurcation of the left carotid artery. It was surrounded by a fibrous capsule, and was closely applied to the branches of the carotid, which showed no changes aside from a few yellowish spots.

- <sup>11</sup> Paltauf, R.: Ueber Geschwülste der Glandula Carotica. Ziegler's Beiträge z. Path. Anat., etc., 1892, xi, 260.
- <sup>12</sup> Monckeberg, I. G.: "Die Tumoren der Glandular Carotica." Ziegler's Beiträge u. Path. Anat., etc., 1905, xxxviii, 1-64.
- <sup>13</sup> Stilling, M. H.: "A propos de quelques expériences nouvelles sur la maladie d'Addison." Revue de Medicine, 1890, x, 808-831.
- <sup>14</sup> Kohn, Alfred: "Ueber den Bau und die Entwicklung der sog. Carotisdruse." Archiv. f. Mikroskop. Anat., 1900, lvi, 81-144.
- <sup>15</sup> Mulon, P.: "Les glandes hypertensives ou organes chromaffines." Archives Generales de Medicine, 1904, ii, 3265.
- <sup>16</sup> Gomez, L. P.: "Studies on the Carotid Gland." Trans. Chicago Path. Soc., 1907-9, vii, 194-195. "The Anatomy and Pathology of the Carotid Gland." Amer. Jour. of the Med. Sciences, 1908, cxxxvi, 98-110.
- <sup>17</sup> Frugoni, C.: "La Glande Carotidienne de Luschka possède-t-elle une sécrétion interne propre?" La Semaine Médicale, 1912, xxxii, 481; "Studi sulla ghiandola carotide di Luschka." Policlinico, Rome, 1913, xx (Sez. Med.), 49.
- <sup>18</sup> Cecca, R.: "Sulla Patologia del Corpuscolo Intercarotideo." Clin. Chir., Milano, 1906, xiv, 1177-1184.
- <sup>19</sup> Rivet: "Tumeur du Corpuscule Carotidien." Gaz. Méd. de Nantes, 1907, xxv, 626-628.
- <sup>20</sup> Cook, Jerome E.: "Case of Tumor of the Carotid Body." Surg., Gyn. and Obs., 1907, v, 324-326.
- <sup>21</sup> Cathcart, R. S.: "Tumors of the Carotid Gland, with Report of a Case." Jour. South Car. Med. Assn., 1908, iv, 304-307
- <sup>22</sup> Zondek, M.: "Ein Tumor der Glandula carotica." Berliner Klin. Wochenschrift, 1908, xlvi, 219-222.
- <sup>23</sup> Licini, C.: "Ueber einen Tumor der Glandula carotica." Deutsche Zeit. f. Chir., 1908, xcvi, 327-339.
- <sup>24</sup> Beitzke, H.: "Ueber einen Tumor der Karotisdrüse." Charité Ann., 1909, xxxiii, 382-389.
- <sup>25</sup> Douglas, J.: "Perithelioma of the Carotid Gland." Medical Record, 1909, lxxv, 397.
- <sup>26</sup> Personal communication from Dr. Wm. B. Coley, of New York. Case 38 is mentioned in the paper by Douglas.
- <sup>27</sup> Green, W. E.: "Tumors of the Carotid Gland: Two Cases." Jour. Amer. Inst. of Homeopathy, 1909, i, 55-57; Jour. of Surgery, Gyn. and Obs., 1908, xxx, 477-480.
- <sup>28</sup> Makara: "Ueber die Geschwülste der Glandula Carotica." Orvosi Hetilap, 1907; Abs. Centralbl. f. Chir., 1908, xxxv, 27.
- <sup>29</sup> Alezais and Peyron: "Paragangliome Carotidienne à évolution épidermoïde. Bull. de l'Assoc. Franc. p. l'Etude Cancer, 1910, iii, 181-190. (Revue de Médecine, 1910, xxx.)
- <sup>30</sup> Kuznetsoff, M. M.: "Tumors of the Carotid Gland and their Surgical Treatment." Khirurg. Arkh. Velyaminova, St. Petersburg, 1910, xxvi, 25-59.

A great part of the tumor is made up of fibrous tissue, which more or less surrounds the sarcoma cells. In the centre of the sarcomatous areas are patches of degeneration. The alveolar arrangement of the large sarcoma cells lead one to conclude that their origin is from the tissue surrounding the blood-vessels."

40. GREEN.<sup>27</sup>—Miss A., aged seven, had a tumor the size of a pigeon's egg on the right side of the neck, just beneath the sternomastoid muscle, on a level with the bifurcation of the common carotid artery. It had been growing very slowly for two years, but gave rise to no symptoms. The tumor was removed by ligation of the three carotids, which it involved. This was followed by right sided paralysis, from which she never entirely recovered. The tumor was very vascular and bled freely.

41. GREEN.<sup>27</sup>—Mrs. B., aged forty-five, had had a slowly growing tumor on the side of her neck for 17 years. It was lying beneath the anterior border of the sternomastoid muscle, was movable, elastic, and slightly pulsating. At operation it was found to extend from the angle of the jaw to near the clavicle. It was bluish in color and very vascular, bleeding freely whenever injured. The carotids were surrounded to its surface. As removal would have involved ligature of all the carotids and the internal jugular vein, with probable injury to the pneumogastric, hypoglossal, glossopharyngeal and descending noni nerves, it was left *in situ*. The clinical diagnosis had been a vascular tumor. Neither of Green's cases were examined histologically.

42. MAKARA.<sup>28</sup>—A boy eighteen years old, had, two years previously, first noticed a small tumor on the right side of his neck. At the time of operation this had reached the size of a pigeon's egg, and interfered with swallowing. The tumor was excised by ligation of the common, internal and external carotids, the jugular vein and nerve trunks being preserved. On the second day after operation the patient developed fever, promptly followed by hemiplegia and dysphagia. Death resulted on the third day from softening of the brain due to interference with the blood supply. The removed tumor was 4 x 3.2 x 3 centimetres, enclosed in a fibrous capsule. Histological examination showed the usual alveolar structure of a tumor of the carotid body. The clinical diagnosis had been an accessory thyroid.

43. ALEZAIS and PEYRON.<sup>29</sup>—These authors report a case of malignant degeneration of a tumor of the carotid gland. The tumor, discovered at the autopsy of an adult, was adherent to the three carotids, the internal jugular vein, and the aponeurotic muscular sheaths. In places there was the ordinary perithelial type of neoplasm of the carotid gland; in other places a tumor of the type of pavement epithelium, tubular or lobulated. The two types were intermingled, but the first type was more abundant near the periphery, while the second type was more abundant in the deeper parts. The cortical layers contained areas showing transition from the usual type of carotid gland tumor to the epithelial type.

## THE EARLY DIAGNOSIS OF HYDRONEPHROSIS BY PYELOGRAPHY AND OTHER MEANS.

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IN dealing with a new and unfamiliar method of diagnosis such as pyelography it is not unreasonable to ask where the necessity for its use arises. To meet this question I shall preface my remarks by a short account of our means of diagnosis of hydronephrosis, and their practical value. Hydronephrosis, as we know it clinically, presents two stages in its development. There is a stage during which symptoms alone are present and a stage where a swelling is constantly or intermittently found in the loin.

I take it that when a large permanent swelling is present there can seldom be any remarkable difficulty in making a diagnosis, first, of a renal tumor and then of the hydronephrotic nature of the tumor, none at least which is not generally recognized and the salient points in the differential diagnosis of which are not worn threadbare by constant repetition. Diagnosis in this, the second stage, need not therefore concern us here.

Two questions do, however, arise in regard to this second stage of hydronephrosis, which have a very direct bearing on our subject. In the first place what amount of damage has the kidney sustained? In other words, what is the value of a hydronephrotic kidney? And second, if the obstruction is relieved will the kidney return to its normal state? Space does not permit of full discussion of these important questions, only the briefest reference to them is possible.

i. In the fully developed hydronephrosis the wall of the sac is reduced to half or one-quarter of an inch in thickness. In this the renal tissue is spread out over a large area and there is an advanced degree of interstitial nephritis.

The patient did well for a while after the operation, but died 23 days later from an apparent septicaemia.

49. SINUSHIN.<sup>52</sup>—In a paper read before a Moscow medical society Sinushin refers to a second case coming under his observation. The patient was a woman forty-eight years old, and the report was made two years after the operation. There were no symptoms other than a gradually increasing swelling. At operation a typical tumor of the carotid body was found in the bifurcation of the common carotid artery, pushing the branches wide apart. The data given is very meagre, but gross and microscopic photographs leave no doubt as to the nature of the growth.

50. CHIARI.<sup>53</sup>—The patient, a man thirty-nine years of age, had noticed a tumor the size of a hazel-nut on the left side of his neck three and one-half years previously. It was smooth, freely movable, and the only symptom was a slight burning sensation. After a few months' duration it began to grow slowly, and about once a week he had attacks of pain radiating to the left side of the chest. As the tumor continued to grow these attacks became more frequent, often occurring several times in the 24 hours, and the pain became so intense the patient was unable to work. On examination Chiari found, in a position corresponding to the bifurcation of the common carotid, a hard smooth tumor the size of a pigeon's egg. It was only slightly movable, and a transmitted pulsation could be felt through it. At operation the tumor was matted to the surrounding tissues. The external carotid was ligated, and the descending branch of the hypoglossal nerve divided. The tumor was then dissected away from the internal carotid and lifted out of the widely dissected angle of bifurcation. Microscopical examination revealed the usual structure of tumors of the carotid body. He rejects the idea of a hyperplasia of the normal gland, as not all the elements of the normal structure enter into the tumor formation. Notable is the absence of ganglion cells in the tumor.

51. HOLLAENDER.<sup>54</sup>—On May 22, 1912, Hollaender demonstrated a tumor of the carotid body before the Berlin Medical Society. The tumor, the size of an egg, had occupied the upper triangle on the left side of the neck of a young actress. The only complaint of the patient was the disfigurement, but on examination a mild exophthalmus was observed. The larynx was displaced to the right. At operation the tumor was found to surround the external carotid, but was dissected away from it and the widened angle of bifurcation without sacrificing either of the carotids or any of the nerves. A mild disturbance of the recurrent nerve persisted for several days, but disappeared completely. No diagnosis was made previous to operation.

52. RANDISI.<sup>55</sup>—The patient, a woman fifty-five years of age, nine years previously had noticed a tumor on the right side of her neck, at the level of the thyroid cartilage. This swelling had very slowly increased in size, but aside from the deformity there were no symptoms. At examination there was a tumor the size of a lemon, of regular, rounded shape, and elastic on palpation. There was a faint pulsation, transmitted but not expansile. As aneurism and malignant growth could be ruled out from this history and the

hydronephrosis in both kidneys and the patient is well and doing a full day's work two years after the second operation and probably much longer after the development of the bilateral hydronephrosis. What remains of the renal tissue in his case has been saved but there is just sufficient to carry on the renal functions and at any time this may fail.

2. After the relief of obstruction, either temporary by natural means in an intermittent hydronephrosis or permanent by operative interference, the kidney does not return to its normal state.

The following case of bilateral hydronephrosis illustrates the gradual decline in the functional powers of the kidneys in spite of successful relief of the obstruction.

CASE I.—Mrs. D., aged thirty, first noticed a swelling in the right side of the abdomen twelve months ago, two months after the birth of her only child. Pregnancy and the puerperium had been normal. There was dragging pain in the loin followed by appearance of the swelling and vomiting. The attack lasted about twelve hours, and then the swelling subsided and a large quantity of urine was discharged. There had been twelve such attacks. There was nocturnal frequency but no other urinary symptoms. On examination there was a large fairly tense movable hydronephrosis on the right side extending as low as the pubic symphysis. A vertical groove indicated the division between the distended renal pelvis and kidney. The left kidney was not palpable. The bladder was healthy, the right ureteric orifice small and surrounded by a blush of congestion. The orifice contracts at regular intervals and emits a copious clear efflux. Left ureter larger and normal in appearance and shows regular contraction and a clear efflux. A No. 7 F. ureteric catheter passed up the right ureter for sixteen inches without meeting obstruction and a constant stream of clear urine flowed from it under considerable pressure which could be increased by pressure upon the hydronephrosis. In half an hour 13 ounces of clear urine were withdrawn, the hydronephrosis was reduced to a flat, freely movable mass and the urine issued from the catheter in slowly intermittent drops. An intramuscular injection of phenol-sulphone-phthalein was made after catheterization of

FIG. 3.



Dr. Lihenthal's first case   Endothelial tumor of carotid body, long standing   Note absence of cachexia

FIG. 4



Dr. Mathew's case   Microphotograph of section removed at time of operation.

alongside this to drain the pelvic cavity and another in the peri-renal tissues. The ureteric catheter was removed at the end of a week and the tube a few days later and the wound healed. The temperature rose a week after the operation and fell to normal after a week. The patient began to lose flesh about the time of the second operation and this gradually progressed until she became emaciated. There was thirst and dry tongue, anorexia and headache and the urine had a specific gravity of 1007. The quantity of urine varied from 30 to 48 ounces. A month after the second operation the symptoms of renal failure gradually increased. The temperature which had been normal became subnormal and the quantity of urine diminished to 28 and then to 18 ounces. She died six weeks after the second operation of renal failure.

There must be a time, I admit, in the early stage of hydronephrosis when permanent relief of obstruction will be followed by complete restoration of the kidney to its former condition. But this time is at the very commencement of the dilatation. It is long past when the kidney can be felt enlarged on palpation of the abdomen.

The damage produced by obstruction in fully developed hydronephrosis is permanent. I shall later show proof of this in several cases (notably Case VI) examined after removal of the obstruction.

From the foregoing it will, I think, be admitted that a diagnosis must be made in the first stage of hydronephrosis, so that operation may be undertaken before permanent damage has been done to the kidney. I shall therefore discuss briefly the diagnosis in this stage, that is, in the stage of commencing dilatation of the kidney when the organ is not yet recognized as being enlarged on palpation of the abdomen.

There are two well-defined clinical groups of cases. In one group some recognized cause of hydronephrosis such as calculus or movable kidney is discovered on clinical examination and in the second group no condition which might cause hydronephrosis is found clinically. The obstruction in the latter group is due to congenital stenosis or valves of the

MacPherson in the summer of 1913 for a growth in his left ear, which was removed at the Post-Graduate Hospital July 1, 1913. The operation was interfered with by the severe pulsatile bleeding. No histological examination was made of the growth, owing to loss of the specimen. Following a positive Wassermann, two injections of salvarsan were given with some apparent improvement. The patient continues to work as a street-car conductor, but has a contracted pupil on the left side and there is a stiffness of the neck. (Microscopical examination of a poorly prepared section from the mass removed by Dr. Mathews convinces me this is an undoubted tumor of the carotid body.) (Presented before the New York Surgical Society, October 22, 1913.)

55. DACOSTA.<sup>41</sup>—March 3, 1913, before the Philadelphia Surgical Society, DaCosta presented a specimen of a tumor of the carotid body, which he had removed from a woman thirty-six years of age. The tumor had been noticed 16 years previously, but growth had been slow until six months before operation. During this six months the tumor had grown more than in the 15½ years before that time. The diagnosis, made before operation, was based on the slow growth for years; the carotid pulsation, which lifted the tumor at every beat of the heart; the absence of expansile pulsation; the size of an English walnut, was removed by ligation of the external carotid, it being dissected away from the internal carotid and jugular vein. The pathological diagnosis was perithelioma.

56. LILIENTHAL.<sup>42</sup>—A woman, M. C., about thirty-eight years old, was admitted to Mt. Sinai Hospital in April, 1906. Ten months before she had first noticed a tumor the size of a marble which at first increased slowly in size, but for ten weeks before admission had grown so rapidly that when she entered the hospital it was enormous, extending from the trapezius posteriorly across the median line in front. There were severe "neuralgic" pains in the head and there was hoarseness from paralysis of the right vocal cord. The tumor felt hard and solid but was not attached to the skin. There was no discoloration. On April 6, Dr. Lilienthal removed a specimen for examination, considering the case inoperable. On July 6, in order to relieve suffocative symptoms, Dr. Elsberg, his associate, attempted to extirpate the mass and succeeded in removing about half of it. She left the hospital about three months later, returning the following March with a huge fungating mass. She died the same month of repeated hemorrhages. Dr. Mandelbaum, pathologist to the hospital, examined the original specimen and also the larger portion which had been later excised. His report is haemangioma arising from perithelium. The cells are uniform, varying but little in size and appearance, thus differing from the usual type of malignant tumor.

57. LILIENTHAL.<sup>43</sup>—October 8, 1913, before the New York Surgical Society, Dr. Lilienthal presented a case of tumor of the carotid body, with the following report: "This woman was presented by me in the spring of 1909 before this society. At that time she was fifty-six years old, and stated that she had had a small lump in the side of her neck for 30 years. For five years before she had consulted me this had increased considerably in size, and during one year it had grown rapidly, so that

passes these attacks become less frequent and in the absence of pain the patient becomes more reconciled to the presence of the calculus in his ureter and less inclined to accept the suggestion of an operation. This prolongation of the intervals of colic with diminution in the severity of the attack and eventual reduction to an occasional ache is, I hold, significant of a dilating ureter and renal pelvis. I shall later show that the renal pelvis becomes less and less sensitive as it dilates until a period is reached when even comparatively powerful distention does not give rise to pain. And, moreover, the muscular tissue of the pelvis and ureter are progressively destroyed so that the muscular spasm which constitutes renal colic becomes less and less violent. The gradual disappearance of colic is therefore an important sign of dilatation, but when it has become apparent the dilatation is already well advanced and permanent damage has been done to the ureter and kidney.

Constant aching may be present in the kidney and is a sign of commencing dilatation. It is, however, often absent and when present may be due to other causes.

Persistent polyuria is a significant symptom when it exists, but it is readily overlooked and when noted may be regarded as a sign of chronic Bright's disease rather than of a dilating kidney on one side. The following case is so interesting in this connection that I venture to insert it here:

CASE II.—W. R. W., a well built man of thirty-eight, was referred to me by Dr. A. J. Whiting, complaining of pain in the left flank and "deterioration of health." Two years previously he had pain in the left loin and albumin was discovered in the urine. The albumin diminished with rest and treatment. Nine months after the first attack of pain there was a second, and similar attacks have recurred at intervals of some months since that time. He suffered from headache, giddiness and nausea. The urine was acid, specific gravity 1006 and contained albumin which varied from a haze to 175 per mg. The quantity varied from 120 to 165 ounces in 24 hours. Casts, blood or pus have never been found in the urine. A small round calculus was shown by the X-rays in the left ureter just outside the

removed the tumor, 5.5 x 4.5 x 2.5 centimetres, by ligation of the external carotid artery and internal jugular vein. A portion of the vagus was resected, the hypoglossal nerve laid bare but not injured. After the operation the right pupil was contracted and irregular, and there was marked hoarseness. Both these conditions were present at the time of discharge, one month later. Histological examination showed a typical tumor of the carotid body.

60. CALLISON and MACKENTY.—The case reported in this paper.

*Recapitulation.*—In the 60 cases of tumor of the carotid body four cases (28, 29, 36, 43) have been found at autopsy. Two (25, 30) were examined post mortem, although the existence of a tumor had been known when death occurred from other cause. The remaining 54 cases have come to operation. In four (41, 54, 56, 60) the tumor was laid bare, only to find such extensive involvement that nothing could be done. All three carotids were ligated in 32 cases, the external only in seven cases. In 15 cases the tumor has been dissected away from all the vessels, or dissected away from the common or internal carotids after ligation of the external. In eight cases recurrence took place, in six of these (5, 7, 14, 24, 37, 39) after the tumor had been dissected away from the blood-vessels, in two cases (38 and 57) after complete removal of all the carotids. In one case examined after death (26) there were metastases in the liver. Of the 54 patients operated on, 42 have recovered and 12 died. But to these twelve deaths must be added four from recurrence and six other speedy deaths in prospect from recurrences known to exist when the case was reported, or 22 deaths in 54 cases. In one other case the patient probably died as a result of the tumor. The causes of death have been: In cases 1, 6, 11, 23, pneumonia, in all of which the pneumogastric was divided or resected at the operation; in cases 3, 32, and 56, hemorrhage; in cases 22 and 41, cerebral anaemia; in case 27, acute oedema of the lungs; case 45, not stated; in case 47, septicæmia; in case 60, infection and hemorrhage.

In addition to this mortality, however, other accidents have arisen in the patients who survived. In cases 2, 12, 26 and 40 the patients have had hemiplegia with aphasia. In

ally increased for 3 years. The pain was worse after muscular exertion and better after rest. For six years he had been subject to attacks of vomiting and for over a year had been treated at a large general hospital for dyspepsia. The urine had not shown any abnormality in quantity or appearance.

In July, 1906, I found a large elastic renal tumor on the right side. An X-ray examination was negative. The right ureteric orifice was thick-lipped, elongated and motionless. A bougie opaque to the X-rays passed up the ureter to the transverse process of the third lumbar vertebra. No urine was obtained by ureteric catheter on the right side. On operating I found a large thin-walled hydronephrotic sac with stenosis at the ureteropelvic junction and performed nephrectomy.

The second type of pain in commencing hydronephrosis occurs in severe intermittent attacks of colic occurring without other symptoms.

The following is an example of such a case when obstruction was due to an aberrant renal artery and vein.

CASE IV.—W. D., a boy aged thirteen, complained of attacks of pain in the left loin during the past eighteen months. The pain was severe and was usually accompanied by vomiting. It did not radiate. There was aching afterward but the boy was quite well in the interval. The attacks came on once a week on Saturday. Friday was a holiday and was spent in playing outdoor games. There had been no haematuria and no sudden variation in the quantity of urine. I examined him after the pain had been going on for about a year but could find nothing abnormal and the X-ray examination was negative to stone. Six months later I again examined him. The lower pole of both kidneys was palpable but no enlargement could be detected and there was no tenderness. On operation I found a lobulated, slightly enlarged kidney with a large distended pelvis. The ureter was normal in size and appearance. Crossing the ureteropelvic junction there was a band of fibrous tissue containing a large artery and vein passing to and from the anterior surface of the lower pole of the kidney. The point of obstruction of the ureter was situated at the crossing of the vessels. The vessels were ligatured and divided and the pelvis opened and

the cases. They have been most usually diagnosed as endotheliomata or peritheliomata. The structure of the case here reported is more closely allied to the endotheliomata than any other form of tumor. Leithoff,<sup>33</sup> in the case reported by von Heinleth, and Woolley, in his own case, lay stress on the sarcomatous change occurring in the new growth. Alezais and Peyron describe a change in their tumor which seems to be carcinomatous. This is, so far as I have been able to discover, the only recorded case in which apparent epithelial change was present. Cecca reports his case as primary angiosarcoma. Until a more definite determination of their nature has been made, the best term to use in their diagnosis is simply "tumor of the carotid body."

*Symptoms.*—The symptoms of tumor of the carotid body are both subjective and objective.

*Subjective Symptoms.*—The patient may present himself at an early stage of the growth, because of the deformity, and desire cosmetic betterment; he may come at a later time, because of fear of the consequences of a rapidly growing tumor of the neck; or he may only present himself for relief from some of the symptoms caused by the progressive damage done by the tumor, as in the case here presented.

In the first case he will complain of no symptoms but the deformity of a tumor of the neck. There is no pain or tenderness, and he only asks for cosmetic improvement.

In the second and third stages the symptoms are due to involvement of the cranial and sympathetic nerves. The number and severity of the symptoms will depend upon the extent to which the tumor has grown. There may be difficulty in phonation or swallowing, or an annoying cough may be present. He may complain of deafness or conjunctivitis. There may be, at a late stage, some pain as nerve trunks are being included in the growth. On the whole, the subjective symptoms are surprisingly few.

*Objective Symptoms.*—The objective symptoms are more numerous and constant than the subjective. The findings on examination will vary according to the stage at which the patient presents himself. In the early stage there is a tumor

THE X-RAYS AND URETERAL CATHETER IN DIAGNOSIS OF  
HYDRONEPHROSIS.

(a) *The outline of the kidney shown by the X-rays.* When the dilated kidney is of large size there is little difficulty in recognizing its dimensions by means of the X-rays. In some cases the great extent of the shadow may tend to obscure the reading of the radiographic plate. The upper pole is under cover of the ribs while the lower is hidden by the shadow of the iliac crest. When calculi are present as they were in Case VI they frequently mark the lower limit of the hydronephrotic kidney and may also show the position of the obstruction at the pelvis of the kidney.

The great extent of the renal shadow will thus be more readily grasped and the reading of the plate become plainer. When the hydronephrosis is of medium size there will be less difficulty in recognizing a renal shadow for the lower limit lies within the clear loin area. There is more difficulty in detecting slight enlargements of the kidney shadow.

An experienced radiographer can show the outline of the kidney even in stout subjects. If a fixed position is used and the kidney is not displaced, the shadow will bear a constant relation to the vertebræ, ribs, and psoas muscle. There is, however, no standard size for the kidney, which will fit all patients. The normal kidney varies in size in men and women and also in different individuals so that slight variations in the extent of the shadow cannot be accepted without further proof, as indicating enlargement of the organ. Apart from that, the varying size of the body makes it impossible to give the kidney the same relation to the plate in each, and unless this can be ensured, uniformity of size of the shadow cannot be obtained. The relation of the kidney shadow to the twelfth rib gives no help, for this rib varies very greatly in length and in the angle it forms with the vertebræ, not only in different individuals but also on each side in the same individual.

(b) *Proportional renal mensuration.* With the object of obtaining some method of measurement which will be un-

Cervical lymph adenitis is usually multiple, and as a rule these nodes invade the surrounding tissues and are matted together. They may be tender. Reclus says they are entirely hard or entirely soft. If the nodes attach themselves directly to the large arteries of the neck, and are very hard, there may be a transmitted pulsation. Finally, the history, with the subcutaneous tuberculin test, with its associated rise of temperature and aggravation of the local picture, may decide their nature.

In carcinoma the primary focus can usually be located, the nodes are usually multiple, are rapidly growing, of stony hardness, and later there will be increasing cachexia and anaemia. Carcinoma usually invades the surrounding tissues, so that motion in all directions is limited.

Sarcoma is rarely limited to one lymph node, but several closely connected glands will be involved. There is movement in all directions in the early stages, and no transmitted pulsation. Pulsation and murmur rule out lymphosarcoma, according to Kopfstein.

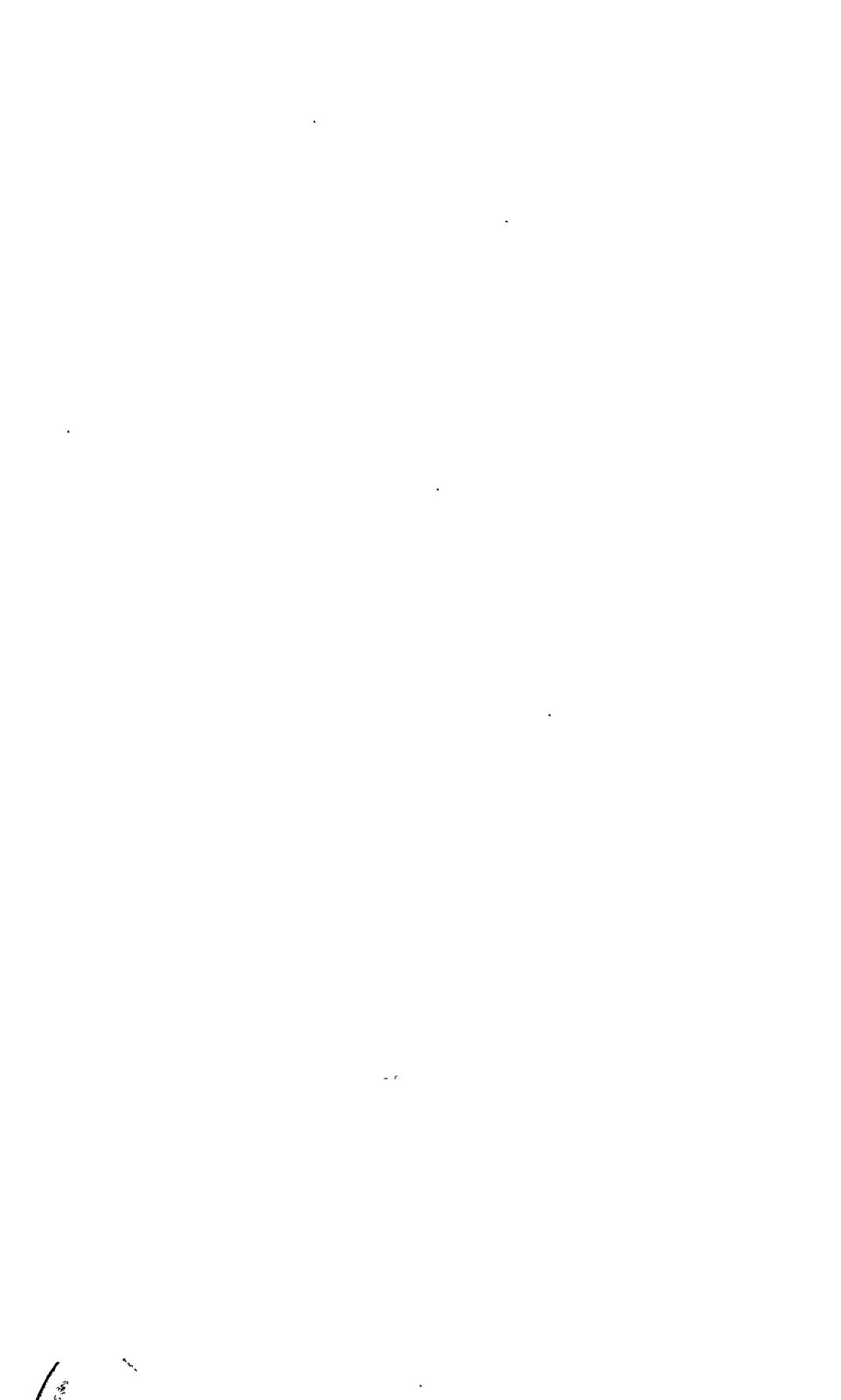
Fibromas are more superficial, harder, and more movable than carotid tumors, and are rarely found in this location. Should one occur, however, its differentiation would be difficult.

Lipomas have a woolly feel, are softer, more superficial and less uniform. They lack the pulsation of a carotid tumor, and are movable in all directions.

Branchial cysts are usually superficial, but they may reach to the deep structures of the neck. As a rule they are congenital. Fluctuation is usually present. After being satisfied that the condition is not an aneurism, aspiration will demonstrate the nature of a cyst, as either a light colored or cloudy fluid will be obtained.

Hodgkin's disease gives multiple nodes, movable, and is bilateral from the first. In density they are intermediate between malignant tumors and tuberculous glands. The nodes feel like lipoma, but are more deeply situated.

Syphilis of the glands gives an adherent, hard, matted



The surgeon may now close up the wound, leaving the tumor *in situ*, as Green did; or he may remove the tumor and arteries together, the usual course pursued. This involves ligation of the common, internal and external carotid arteries, also probable ligation of the internal jugular vein, and the attendant danger of injuring the pneumogastric, hypoglossal and other nerves. The surgery now changes from that of a tumor of the carotid body to that of the carotid artery. As this is one of the most formidable and dangerous operations the surgeon is called upon to perform, each must decide for himself the course to be pursued.

In closing I wish to thank Drs. Mathews, Lilienthal, and Coley for the personal cases they have given me; Prof. Ewing for his suggestions as to the nature of the tumor; Dr. H. T. Brooks for suggestions in the preparation of the paper, and Mr. Wm. S. Dunn, of the Photographic Department of Cornell University Medical College, for furnishing the microphotograph used in the illustration.

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renal pelvis. The urine is allowed to run off and warm boracic solution or saline solution is slowly injected into the renal pelvis by means of a syringe. When the pelvis is full the tension causes pain in the kidney. The quantity which has been injected is now noted and is taken as the capacity of the renal pelvis. If the injection be stopped the pain passes off quickly as the fluid drops away from the ureteric catheter. If the fluid is too cold or if it is injected too quickly, spasm of the renal pelvis is set up and pain occurs before the pelvis is full. A capacity of 30 to 40 c.c. represents a slight degree of hydronephrosis. According to Braasch<sup>3</sup> if 150 c.c. can be injected but little secreting tissue remains.

In practice there are certain difficulties and fallacies in this method. There are at present very divergent views as to the normal capacity of the renal pelvis. Luys states the normal capacity as 2 to 3 c.c. Braasch found the renal pelvis post mortem had a cubic content of 2 to 5 c.c. whereas in the living it will often hold 20 c.c. or more, while Bazy looks upon a pelvis which contains 30 to 35 c.c. as normal. In my own cases checked by pyelography or operation the normal pelvis did not exceed 5 or 7 c.c. in capacity and was usually less. Until we can obtain more extensive observations on the capacity of the healthy pelvis, the earlier stages of dilatation are likely to be overlooked by this method.

Another fallacy is the escape of some fluid along the ureter outside the catheter. By placing a catheter in the urethra and coloring the injection fluid with methylene blue any escape will be detected by the urine draining from the bladder being tinged with blue, but the amount cannot be measured, as it will be blended with the urine from the other kidney.

Still another fallacy appears to me to arise in making these observations. A kidney working under raised pressure, as these slightly hydronephrotic kidneys are, usually shows polyuria. With a fine-bore catheter, such as we use for the ureter, it is difficult to empty the pelvis completely when an abundant polyuria is in progress, and it is certain that while the boric lotion is being slowly injected the kidney is rapidly

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- <sup>42</sup> Lilienthal, Howard: "Endothelioma of the Carotid Body," *ANNALS OF SURGERY*, 1909, 1, 808, and personal communication.
- <sup>43</sup> Graham, Allen: "Tumors of the Carotid Body, with Report of Two Cases," *Cleveland Med. Jour.*, 1913, xii, 537-550.

the catheter and the fluid allowed to syphon off. The catheter is removed at the end of ten minutes.

In normal individuals the amount of pain varies. Some have pain only at the time of full distention of the pelvis, others have a dull aching for several hours. In one case, that of a very nervous woman, there was a complete absence of pain at the time of full distention of the pelvis, but a feeling of rawness in the pelvis and ureter the next day. There was no dilatation of the pelvis in this case. In another case of commencing dilatation when the pelvis held 18 c.c. of collargol solution there was no discomfort until two hours later and this quickly passed off.

In some cases a severe attack of renal colic follows the examination. It is very important to avoid this during the radiographic exposure as, apart from the inconvenience to the patient, the tense rigid muscles obstruct the passage of the X-rays and this, together with the movement of the patient and the arching of the back which interfere with the action of a compressor, all militate against the production of a sharply defined shadow. The colic may be due to several factors: too rapid filling of the pelvis, too great pressure in injecting the fluid and thus causing over-distention of the pelvis, too cold or too hot solution of collargol are all contributory causes. These points should therefore receive the most careful and detailed attention and the introduction of the fluid should at once be stopped when the sensation of tension in the renal pelvis commences. I have abandoned the practice of giving a hypodermic injection of morphia before the operation as I believe the sensations of the patient are an important guide in the operation. What can we learn by this method?

i. *Is dilatation present?* It is possible during the introduction of the collargol to say with tolerable certainty whether dilatation is absent or whether advanced dilatation is present. When the pelvis is not dilated the flow of collargol is slow, the patient soon feels pain in the kidney and the quantity that enters is small. The greater the extent to which dilatation has developed, the less sensitive does the pelvis become. I have

The functional value of such a kidney is greatly impaired. The percentage of urea is diminished. The following is the result of 8 examinations made in a case of movable hydronephrotic kidney:

Left kidney (hydronephrotic).	Right kidney (healthy).
Urea 0.45 per cent.	Urea 1.4 per cent.
Urea 0.55 per cent.	Urea 1.5 per cent.
Urea 0.68 per cent.	Urea 0.93 per cent.
Urea 0.45 per cent.	Urea 0.89 per cent.
Urea 0.49 per cent.	Urea 0.9 per cent.
Urea 0.5 per cent.	Urea 1.0 per cent.
Urea 0.6 per cent.	Urea 1.0 per cent.
Urea 0.55 per cent.	Urea 1.0 per cent.

Variations in the elimination of sodium chloride and phosphates follow those of urea. The methylene blue test shows a corresponding reduction in the functional power as the following observations show:

Healthy kidney.

Elimination of blue:	Commenced fifteen minutes.
Quantity satisfactory.	Duration 4 days.

Elimination of chromogen:

Commenced fifteen minutes.	Quantity satisfactory.
Duration two days.	

Hydronephrotic kidney.

Commenced three hours.	Quantity very small.
Duration 3 days.	

Commenced six hours.

Quantity greater than blue.	Duration three days.
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Significant figures are also obtained by the use of phloridzin. In a case of calculous hydronephrosis the injection of 5 mg. phloridzin gave the following result:

Right healthy kidney.  
Sugar, .510 gramme.

Left hydronephrotic kidney.

Trace.

In a case of bilateral hydronephrosis the intramuscular injection of 5 mg. of phenol-sulphone-phthalein was followed by staining of the urine in 29 minutes. The left kidney was completely blocked and no urine passed, the urine from the right kidney showed a percentage of the coloring material of 3.25 during the first hour and 2.25 during the second hour instead of 40 to 60 per cent. during the first hour and 20 to 25 per cent. in the second hour observed in the normal individual.

But although the function of these kidneys is greatly impaired they are not worthless. I shall later describe a case (Case VI) in which I operated for the relief of advanced

each other and they gradually become drawn into the renal pelvis until they have completely disappeared. In this type of hydronephrosis the collargol shadow shows a large uniformly opaque globular shadow on the surface of which small bosses may project (Fig. 11).

An important factor in the production of certain forms of hydronephrosis is some variation in the angle of union of the renal pelvis and ureter. I find that information in regard to the contour of this junction can be obtained by pyelography. In the normal individual the ureter passes up alongside the bodies of the lumbar vertebræ crossing the transverse processes of the fifth and fourth lumbar vertebræ and the tip of the transverse process of the third lumbar vertebra. Its axis is then continued directly into that of the pelvis of the kidney. This can be demonstrated by pyelography with an opaque catheter in the ureter. The line which this catheter takes in the normal individual is either quite straight or has a gentle curve outward commencing at the level of the third lumbar vertebra. A kink of this ureteropelvic junction is shown by pyelography in Fig. 10, a case of movable kidney which has been anchored in a faulty position. In another case of lateral curvature of the lumbar vertebra a very marked distortion of the ureteropelvic junction with irregular dilatation of the calyces is seen (Fig. 4). Further information may also be obtained.

An opaque flexible catheter or bougie passed up the ureter into the kidney pelvis enters the upper calyx of the kidney in the normally placed non-dilated organ. This is seen in Fig. 3 where the renal pelvis and calyces are filled with collargol and throw a sharp shadow. The catheter shadow is denser than that of the collargol and the point is seen lying in the upper calyx. When, however, the kidney is displaced downward or the pelvis dilated the catheter does not enter the calyx but impinges on the upper wall of the pelvis pushing it up like the pole of a tent (Fig. 11).

Another point of extreme interest which is seen in examining plates showing the collargol filled pelvis and calyces with

the second ureter. No urine escaped from the catheter in the left ureter during the whole of the test. The urine from the right kidney became colored in 29 minutes. During the first hour only 3.25 per cent. and during the second hour a similar percentage of the coloring material was obtained. On the following morning a hydronephrotic swelling was found on the left side of the abdomen. This was slightly smaller than that on the right side.

On July 16 the following operation was performed on the right kidney: (1) The kidney was exposed and dislocated from the wound. The ureter was found bound down to the surface of the greatly distended pelvis by fine adhesions and was dissected up to its insertion into the pelvis. A large flap of fibro-fatty tissue covering the posterior surface of the greatly distended pelvis was turned back. A triangular area, the size of the palm of the hand with the apex toward the ureteropelvic junction, comprising nearly the whole of the posterior wall of the pelvis was removed. The pelvic ureteral junction was narrow and the incision was carried down through this into the ureter and this part of the incision stitched transversely. The edges of the pelvic wound were brought together by a series of interrupted catgut sutures and the line of suture was covered by the flap of fibro-fatty tissue. The capsule was stripped from the posterior surface of the kidney and the organ fixed by catgut sutures to the posterior abdominal wall. Blood appeared in the urine for three days and then the urine became clear. Healing was aseptic.

The left kidney continued painful and distended. Three weeks after the operation the right kidney was not enlarged or tender but the left kidney was large, tense and painful. Cystoscopy showed a copious clear efflux from the right ureteric orifice. The left ureteric orifice was widely open and showed an occasional feeble contraction without efflux.

A ureteric catheter passed for 12 inches and was then arrested. It passed on after a little manipulation and urine flowed. On August 9 a plastic operation similar to that done on the right kidney was performed on the left kidney. The contents of the kidney were turbid and there were six small faceted black stones. A ureteral catheter was passed through an incision in the convex border of the kidney across the cavity of the pelvis and down the ureter for two inches. A rubber tube was placed

position, shape, and movements closely resemble an enlarged kidney, the history may give no clue to its origin and there are no changes in the urine and no symptoms pointing to disease of other organs to indicate the nature of the tumor. In such a case the collargol method gives invaluable information.

In Case XIII there was an abdominal tumor which had the shape and position of a kidney and which had been diagnosed as a hydronephrosis by a surgeon of large experience. Pyelography showed that the renal pelvis and calyces were normal in size and outline and were situated some distance above the swelling. Operation demonstrated a mass of hydatid cysts attached to the under surface of the liver.

Two other cases operated on in succession on the same day may be quoted in illustration of the use of this method. Both patients were women. In the first there had been attacks of pain in the right side of the abdomen, an indefinite history of an attack of haematuria and a doubtful history of jaundice lasting two or three days. There was a large rounded swelling in the right lumbar region which in many respects resembled an enlarged kidney. Collargol injection showed the pelvis and calyces of the right kidney normal and situated high up beneath the ribs. Operation showed the right lobe of the liver dragged down and with its edge concealed by adherent bowel and a gall-bladder full of gall-stones.

In the second case there was a swelling in the left loin with a history of "cystitis." Pyelography demonstrated a normal pelvis and calyces situated above the mass. Operation showed a hard fibrolipomatous mass adherent to the lower end of the kidney and to the colon in the midst of which were caseous masses. The details of the cases are given on a later page.

Let us now give some illustrations of the value of this method.

1. *Calculus impacted in the ureter. Is dilatation of the kidney commencing?* (Figs. 5 and 6.)

ureteropelvic junction or to the pressure of aberrant renal vessels.

I. I shall take the simple stone cases first. The diagnosis of stone in the pelvis of the kidney or impacted in the ureter does not come within the province of this article. I wish to take a step further.

Let us suppose that the diagnosis of stone at the upper end of the ureter or of stone impacted in the ureter is made by symptoms and by the X-rays. The question will at once arise, "Is the presence of the stone causing damage to the kidney?" It might do so in two ways, either by being the predisposing cause of infection or by causing dilatation of the ureter, pelvis and kidney. This question has a very important bearing on our decision in regard to immediate operation.

Few surgeons will, I think, state that every calculus which is recently impacted in the ureter must at once be removed. In my experience over 50 per cent. of calculi found in the ureter are passed into the bladder and discharged with the urine. There are calculi which from their large size or oval, round, or elongated contour, as shown by the X-rays, we know cannot pass and must be removed by operation. To these I need not further refer. But there is a larger class of cases where a small oval calculus has recently become impacted in the ureter. By energetic diuretic treatment supplemented sometimes by a visit to a suitable watering-place, a large number of such calculi pass and no surgical operation is required. In others this treatment fails, obstruction commences gradually and the ureter and kidney become dilated. At what period must we say that diuretic treatment has failed and operation is imperative? Undoubtedly as I have already insisted, in the earliest stage of dilatation, before permanent damage has resulted.

What now are the signs of commencing dilatation of the kidney in a case of ureteric calculus? Pain has been present in the form of renal colic. There may have been a single attack and no more, but usually there are repeated attacks at irregular intervals depending upon exercise or the taking of diuretics, medicinal or dietetic, or upon other causes. As time

quantity of collargol which escaped from the kidney alongside the ureteric catheter.

I removed the ureteric calculus by the extraperitoneal route and the patient made an uninterrupted recovery.

*2. After removal of a calculus which has obstructed the ureter and caused dilatation of the kidney, does the kidney return to its normal state?*

CASE VI.—A. W., aged thirty-three, came under my observation at the Hampstead General Hospital in July, 1910, complaining of pain in the left side of the abdomen. He had suffered from pain in the left loin after exercise since he was four years old. At the age of 20 he lost this pain, but had pain along the urethra and at the age of 26 the loin pain returned and has continued since. He had been treated for dyspepsia before he came under my care. Neither kidney was palpable. A radiogram showed a large calculus in the pelvic segment of the left ureter (Fig. 7). This was removed in July, 1910, and the ureter was found dilated. No obstruction to the passage of bougies along the ureter remained after removal of the stone.

In November, 1910, he suffered from continuous haematuria for some weeks from the right kidney, but this kidney could not be felt on palpation of the abdomen. In February, 1911, I examined the kidneys with a view to operation on the right. I wished particularly to ascertain if the dilatation which I knew must have existed in the left kidney still remained.

The left ureter was catheterized and 40 c.c. of collargol solution (10 per cent.) introduced. There was no pain. A radiogram showed a dense collargol shadow on the left side which had the outline and appearance of a dilated kidney (Fig. 8). The rounded pockets of the hydronephrotic kidney were represented as dark rounded collargol shadows and these were separated by fine clear lines representing the fibrous septa.

On the right side the upper part of the kidney shadow lay behind the eleventh rib while a stone shadow in the lower part of the kidney lay below the crest of the ileum and another, evidently the plugging calculus, lay at the edge of the psoas at the level of the third lumbar vertebra. There was evidence here of a very large hydronephrosis on the right side and a smaller hydronephrosis on the left, yet neither could be felt on palpation of the abdomen.

bladder. The ureteric orifice was surrounded by thickened, deep red, wrinkled mucous membrane.

In consultation, the late Sir William Allchin held that chronic interstitial nephritis was present in addition to the stone and was the cause of the polyuria although the absence of cardiovascular changes was remarkable. The stone was removed extraperitoneally and the ureter was found dilated to the size of the little finger. Convalescence was uninterrupted. The sequel was striking and I am indebted to Dr. A. R. Whiting for a most painstaking examination of the urine. The quantity of urine fell to an average of between 40 to 50 ounces in 24 hours with a specific gravity varying from 1010 to 1024 and urea from 6 to 7 grains per ounce. In two months the albumin had completely disappeared.

It will be seen that the symptoms of gradual dilatation of the kidney in ureteric calculus are few and variable and until dilatation has become fully established a diagnosis cannot be made. Similar difficulties exist in regard to the early diagnosis of hydronephrosis resulting from abnormal mobility of the kidney.

2. I shall now refer to the second class of cases where no obvious cause of obstruction is discovered clinically and at operation the block is found to be due to congenital stenosis or valve formation at the ureteropelvic junction, or to the pressure of an aberrant renal artery. The symptoms that may precede the appearance of a tumor in the loin in these cases are pain and intermittent polyuria. Two well-defined types of pain are observed. In one there is constant dull aching which may be worse on movement or on lifting weights. The following case illustrates this type:

CASE III.—G. J., a warehouseman, aged forty-two, came under my observation at St. Peter's Hospital in July, 1906. He had suffered for eight years from dull aching pain in the right side of the abdomen extending round to the back. He had been examined at St. Peter's Hospital when the pain first began but nothing was found. The pain gradually subsided and he felt little of it for 4 or 5 years and then it appeared again and gradu-

so that some dilatation is present, but it is insignificant. The ureter passes in a straight line into the pelvis so that there is no angling. The angle between the lowest calyx and the pelvis is wide.

From this examination I concluded that there was no important degree of dilatation and therefore no stenosis.

*4. A movable kidney is present and hydronephrosis is diagnosed. Is dilatation present, and if so, what is its extent? (Fig. 9.)*

In the following case hydronephrosis had been diagnosed by a competent surgeon and the diagnosis confirmed by a second surgeon. It was proved by pyelography that no dilatation of the renal pelvis or calyces was present.

CASE VIII.—A. E., a servant maid aged twenty-nine, had an attack of pain in the right side of the abdomen in June, 1911, and was confined to bed for a week. In August she complained from time to time of dull aching pain in the right loin. In December, 1911, she had a severe attack of pain in the right iliac fossa radiating to the thigh and back, and accompanied by increased frequency of micturition, urgency and some pain and there was nausea and constipation. She was examined by a surgeon who did not feel the kidney on the first occasion but some days later a tender elastic swelling was felt in the right side of the abdomen which he regarded as a distended kidney. The patient stated that she felt a lump in the right side which disappeared at intervals and after relief from the pain she passed a large quantity of urine. Examination by a second surgeon gave on one occasion a negative result and on another a swelling was found. The case was referred to me as one of intermittent hydronephrosis in a movable kidney.

I was unable to feel the kidney on either side on the occasion on which I examined her and there was no tenderness. The bladder had a normal capacity and showed slight cystitis at the base, especially on the right side. A No. 7 silver wire bougie passed easily up the right ureter to the renal pelvis and collargol was introduced. The collargol solution flowed very slowly and required some pressure on the piston of the syringe. Pain appeared in the right kidney region soon after the injection of collargol was commenced, and rapidly became acute.

examined. No obstruction remained after cutting the vascular band. The lower pole of the kidney became blanched and remained pale for about a quarter of an hour when it gradually assumed a deep red color.

Constant aching pain in the renal region may arise from many conditions other than early hydronephrosis. I have seen it in osteo-arthritis of the vertebræ and this subject has been referred to in an excellent article by Dr. Chute of Boston.<sup>2</sup> There are also bowel pains, duodenal or colon, and gall-bladder pains which lie so near to the kidney area as to make confusion possible. But apart from extrarenal causes of pain there are many conditions which may give rise to pain in the kidney even when the common surgical causes such as stone, tuberculosis and growths are excluded. Unilateral renal aching may occur in slight pyelitis, interstitial nephritis, phosphaturia, and oxaluria. It is not possible to submit every case of renal aching to operation, but short of this a diagnosis of commencing hydronephrosis cannot be made from pain alone.

Acute attacks of renal pain are more likely to lead to a diagnosis, but even here, attacks of vomiting or other collateral symptoms are likely to lead the surgeon astray when the lower pole of the kidney can be felt normal in size. Intermittent polyuria is an unreliable symptom. Time and again I have received a clear account of this symptom and found no dilatation of the kidney at operation. Two examples of this will be described later (Cases VIII and IX).

Intermittent hysterical polyuria is common and when this is combined with abdominal pain nothing appears to be wanting in the history of an intermittent hydronephrosis, especially when the kidney is unduly movable.

In the foregoing remarks I have endeavored to show that a diagnosis of dilatation of the kidney is seldom if ever made before a palpable tumor appears in the loin and that when the hydronephrosis has reached this stage there is extensive damage to the kidney which is permanent.

I shall pass now to the methods by which a diagnosis of dilatation of the kidney can be made in its earliest stage.

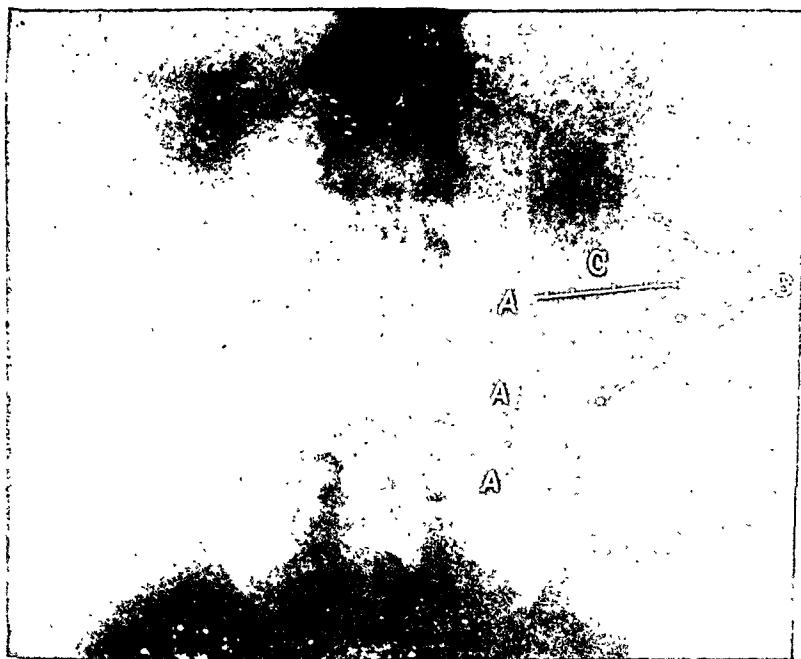
orifices were normal. There was no obstruction to the passage of a catheter up the left ureter. Collargol was injected and almost immediately pain was felt in the left kidney. A radiogram (Fig. 3) shows the ureter and pelvis in a continuous curved line passing upward and outward from the level of the transverse process of the fourth lumbar vertebræ. There is no kinking of the ureteropelvic junction. The pelvis is of the funnel-shaped type and is situated at the level of the upper part of the third lumbar vertebra and is lower and further from the vertebral column than normal. The point of the catheter is seen lying in the upper calyx having passed into it in a direct line from the ureter and neck of the pelvis. Passing outward from the pelvis are two branches, one of which passes transversely and another vertically downward from the lower angle. The angle between the lowest branch and the neck of the pelvis is wide. It will be seen from these details that no trace of dilatation of the calyces or of the pelvis exists.

6. *Nephropexy has been performed at a previous date, there is renal pain on movement and the kidney can be felt to swing laterally. Is there kinking of the ureteropelvic junction? (Fig. 10.)*

CASE X.—A woman, aged forty-eight years, came under my observation at the Hampstead General Hospital. She complained of pain in the right side. The pain varied in severity and was relieved by lying down. There was increased frequency of micturition to every hour during the day and three or four times during the night. Nephropexy has been performed at another hospital eight years previously. On palpation the right kidney was readily felt in the right loin and the lower pole reached below the level of the umbilicus. I noted "the kidney appeared large, especially the upper part, which was more bulky than the lower part."

The kidney moved with respiration but had a comparatively limited excursion and the lower pole appeared to swing toward the middle line so that it lay transversely. The bladder and ureters were healthy. The capacity of the right renal pelvis was 27 c.c. Collargol solution (10 per cent.) was introduced and a radiogram taken. The radiogram (Fig. 10) shows the ureter passing up in front of the transverse processes of the lumbar vertebræ and opposite the body of the third lumbar vertebra, it

FIG. 1.



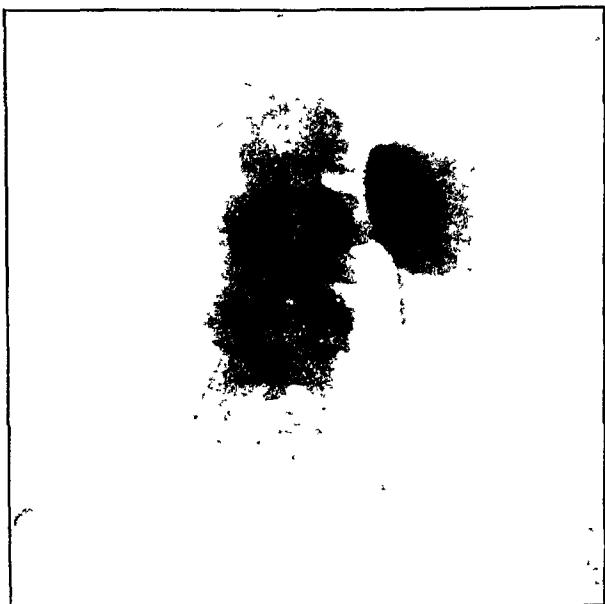
Measurement of the kidney shadow. *A, A, A*, opaque segments ( $\frac{1}{2}$  inch) of catheter; *B*, points at margin of kidney shadow; *C*, measuring line, in half inches, across kidney shadow.

FIG. 2.



*C*, dichotomous pelvis, not dilated; *D, E*, calyces; *B*, junction of ureter and pelvis. *A*, opaque catheter in ureter.

FIG. 11.



Hydronephrosis, pelvic type. Note dilated pelvis and on right of this dilated kidney; catheter raising up roof of pelvis; waves of collargol passing down ureter.

FIG. 12.



Hydronephrosis of pelvic type, due to pressure of aberrant renal vessels.

affected by the size of the individual and the distance of the kidney from this plate I have used the shadow thrown by the vertebral bodies in the individual under examination as a means of measuring the size of the kidney. The variation in the breadth of the vertebral bodies appears to run parallel with the variation in size of the normal kidney and, presuming that the kidney is not displaced, a fact that is easily ascertained, the method is a sufficiently accurate guide for routine examination. It is as follows:

If the narrowest transverse measurement of the shadow thrown by the first lumbar vertebra be taken and this measurement doubled and projected transversely from the outer edge of the vertebral body at its middle, a point will be found. If the same measurement be made in regard to the second and third lumbar vertebrae two other points will be obtained. By joining these three points the outer border of the normal kidney is roughly indicated. Any increase beyond this line may be regarded as abnormal.

Further I have found it possible to measure the size of the kidney and to express the measurement in inches or fractions of an inch in the following manner. My ureteric catheters are made with an alternate opaque and translucent band each of which is half an inch. If one of these catheters be passed up the ureter to the kidney the opaque and translucent bands will show in the same plane as the kidney and the relative shadow value of half an inch is obtained. By marking a piece of paper in half inch values and laying it across the kidney shadow the actual size of the kidney is found (Fig. 1). Anatomically there is a slight difference between the X-ray shadow of the kidney and the actual breadth of the organ. The kidney does not lie absolutely flat, for the hilum is tilted slightly forward so that the shadow is narrowed to an insignificant extent.

An increase in size in the outline of the kidney indicates that dilatation has already taken place.

(c) *Kelly's method of estimating the capacity of the renal pelvis.* A ureteral catheter is passed so that the eye enters the

renal pelvis and the outline of a dilated kidney. The pelvis is roughly quadrilateral in shape the upper and inner angle being formed by the catheter passing up this part of the pelvis. The renal portion of the shadow is a long oval shape with an undulating outline from the shallow pockets in the kidney being filled with collargol solution. From the lower and inner corner of the renal pelvis the ureter is seen to pass downward as a dark line varying in thickness as far as the level of the middle of the sacro-iliac synchondrosis. There are two narrow and two broad segments. The first narrow segment is at the uretero-pelvic junction at the level of the intervertebral disc between the third and fourth lumbar vertebræ, then there is a short thickened segment extending to the lower border of the transverse process of the fifth lumbar vertebra and from this to the lower limit of the plate the opaque line is much thicker. In the narrow segments only the opaque catheter is seen, while in the thick segments are collections of collargol.

The phenomenon of ureteral contractions is here graphically demonstrated. The lower segment between the two broad bands is the full length of a wave of ureteral contractions passing down the ureter. In the narrow portion an opaque segment of catheter, 1 centimetre in length, is lying and by using this it is found that the length of the contraction wave is two centimetres.

*8. Attacks of colic for three years, previous examination negative, recently left kidney felt enlarged. Collargol shows dilated pelvis. Aberrant renal artery on operation (Fig. 12).*

CASE XII.—F. H., a dental mechanic aged twenty-one, had complained of attacks of pain in the left loin during the last three years. Two years ago he was admitted to St. Peter's Hospital on account of renal colic, but the examination by X-rays was negative and the kidney was not palpable. Since that time he has had attacks of renal colic on an average of once a fortnight. The pain commences as a dull ache in the left posterior renal region and steadily increases reaching the maximum in two hours and then it radiates down the left side of the abdomen almost to the groin. Sickness and vomiting accompany the attacks. There has never been a haematuria and there has been no sudden increase in the quantity of urine after the attacks. The kidney has on one occasion been found enlarged and tender. There was no stone shadow with the X-rays.

secreting urine. The distention of the pelvis is thus due, not only to the artificial injection but also to the urine. I believe therefore that the capacity of the pelvis is frequently underestimated by this method.

(d) *Pyelography.* By this method, introduced by Voelcker and Lichtenberg, a diagnosis of dilatation of the kidney pelvis and calyces can be made before the outline of the organ is increased in size.

Pyelography consists in filling the pelvis of the kidney with an innocuous fluid opaque to the X-rays and obtaining a radiogram. The method of pyelography has been fully described elsewhere and only the salient points need be repeated. A catheter is passed up the ureter so that the eye enters the renal pelvis and the contents are allowed to run off. The bladder is emptied and the cystoscope removed leaving the ureteric catheter in position. The collargol solution is heated and slowly introduced. I use either a solution of 10 per cent. or 20 per cent. and introduce it by means of an all-glass syringe of 20 c.c. capacity. A blunt hollow needle is used and fits into the catheter and a fine plug should be provided to fit the catheter after the injection is complete. The fluid is introduced by hydrostatic pressure aided by an occasional touch of the finger and of the piston. The barrel of the syringe filled with solution and with the piston in place is attached to the catheter by means of the needle and held as high as the free end of the ureteral catheter will allow. This is about a foot above the level of the body. The quantity introduced varies with the capacity of the pelvis; 40 c.c. or more may be required in a dilated kidney. The patient gives the signal to stop when he feels pain in the pelvis of the kidney. The syringe is then removed and the end of the ureteral catheter plugged and the radiographer proceeds without delay with his photography. The value of the radiogram is much enhanced by the use of an opaque catheter which shows the line of the ureter and the angle of the ureteropelvic junction. When the radiogram has been taken the plug is removed from .

*Operation reveals hydatid cysts projecting from under surface of liver (Fig. 13).*

CASE XIII.—L. C., a nursemaid aged twenty-seven, complained of attacks of acute pain in the right loin. Three and a half years ago she had an operation for appendicitis.

Four months ago she had a series of attacks of violent pain in the right side of abdomen situated over the right kidney and radiating transversely round the abdomen to the middle line but not downward. The pain commenced suddenly and was very severe, necessitating the administration of morphia. Vomiting usually accompanied an attack. There were about 12 attacks in the first week each lasting from 30 to 40 minutes. For three and a half months there has been no recurrence of the pain. An abdominal swelling was noticed when the pain commenced. She was examined after an attack of pain by a surgeon of recognized experience in urinary surgery who diagnosed an enlarged tender kidney and pronounced it a hydronephrosis or a tuberculous kidney. Since that time the swelling had remained unchanged.

When I examined her (November, 1912) there was a reniform swelling in the right side of the abdomen with the long axis placed obliquely from above down and inward. The mass was rounded and prominent and there was a rounded upper pole two finger-breadths below the costal margin. On the rounded outer border there was a nodule the size of a walnut. The inner border was depressed like the hilum of the kidney. The surface of the mass was smooth and the consistence uniformly hard. The mass moved in a vertical direction with respiration and was freely movable on palpation, passing downward to an inch below the level of the umbilicus and inward for two inches across the middle line.

The urine contained no abnormal elements. Cystoscopy showed a healthy bladder and normal ureteric orifices. Pyelography (Fig. 13) showed the renal pelvis and calyces normal in size and contour and situated at the level of the twelfth dorsal and first lumbar vertebræ, high above the position of the swelling. On December 6, 1912, I exposed the right kidney and found it normal. The abdominal cavity was then opened and a long, firm, yellow, kidney-shaped mass found adherent to the under surface of the lower border of the liver. After removal of adhesions to the bowel this was found to be a hydatid cyst and was removed.

already referred to this insensitiveness of the dilated renal pelvis as an important point in clinical diagnosis apart from pyelography. Pain appears late and is moderate and may amount merely to a dull ache. The fluid enters rapidly and in quantity.

The outflow of collargol after the examination also varies. The non-dilated pelvis with its healthy muscular wall rapidly gets rid of the collargol and the urine is clear in 24 hours or even in 12 hours. In one case the urine was stained only the first micturition after the examination. In the dilated kidney the urine remains stained for several days or a week or even longer.

On examining a number of plates it will be seen that there are two chief types of normal pelvis. In one, the dichotomous pelvis (Fig. 2), the upper end of the ureter splits into two branches without any dilatation and from these branches the calyces arise. In the second form of pelvis the ureter expands into a funnel-shaped pelvis (Fig. 3) from which primary branches project and on these are set the calyces.

When dilatation commences the calyces become clubbed and then elongated so that in a kidney, the seat of moderate distention, the calyces are seen as long processes with rounded ends penetrating deeply into the shadow thrown by the renal substance, and eventually reaching the surface of the kidney. They are well seen in Fig. 6 where the outline of the kidney is clearly defined and the opaque clubbed calyces extend to the limits of the renal shadow. At this stage the true pelvis of the kidney is not necessarily much dilated. In Fig. 6 it does not appear to be dilated at all. This is the "renal" type of hydronephrosis, the final stage of which is seen in Fig. 8. In this case of advanced hydronephrosis the fibrous septa remaining between the pockets of the hydronephrosis, which were originally the calyces, could be detected as clear lines cutting into the opaque block of the collargol filled kidney (Fig. 8).

In the "pelvic" type of hydronephrosis the funnel-shaped pelvis becomes more and more globular. As dilatation proceeds the calyces become broader and shorter and approach

Examination of the abdomen showed a tumor in the left loin at the level of the iliac crest. This had a rounded lower border and passed upward beneath the ribs. It gave the impression of a partly distended hydronephrosis.

The renal pelvis held 18 c.c. and the collargol solution (20 per cent.) flowed easily. There was no trace of discomfort and the introduction was stopped as the flow had ceased. Radiography showed the renal pelvis tensely distended with collargol solution (Fig. 15). There are three primary divisions and each splits into two branches. There is no dilatation of the calyces. The renal outline is normal. At the lower end of the renal shadow there is a dark opaque mass. No pain followed the examination and the kidney was palpated next day without a trace of tenderness. An oblique incision was made and the lower pole of the kidney was found to be embedded in a hard apparently fibrolipomatous mass which extended downward into the left iliac fossa and inward beneath the descending colon. The colon was firmly adherent to the mass and was dissected off with considerable difficulty. It was impossible to separate the mass from the lower pole of the kidney which was invaded by it and nephrectomy was performed. On section of the kidney the pelvis was found to be normal and the mucous membrane healthy and glistening. The lower pole of the kidney showed streaks of fibrous tissue passing in from the surface with a few small yellowish patches and a greatly thickened capsule. Microscopical examination showed the mass to be a mixed celled sarcoma with large areas of degeneration and infiltration with inflammatory round-cells. The growth originated outside the kidney capsule.

#### DIFFICULTIES, FALLACIES AND DANGERS OF PYELOGRAPHY.

The method so far as can be judged by published work has been successful in the hands of a few observers, while others have had to confess to failures in a number of cases.

It would be surprising if, at first, some failures did not occur in a method which is dependent upon a high degree of manipulative skill on the part of the surgeon and corresponding proficiency on the part of the radiographer. That some failures should have occurred does not appear to me to detract from the value of this method.

an opaque catheter in the ureter is the variation in the angle formed by the ureter and outer and lower margin of the pelvis with the inner margin of the shadow by the lowest calyx.

This pelvocalycine angle is a widely open angle with a rounded apex in the normal state (see Figs. 3 and 9). When the calyces of the kidney begin to dilate in early hydronephrosis this angle is reduced in size and as dilatation proceeds the shadow thrown by the lower calyx approaches that of the ureter until the angle becomes acute and the space between the shadows is reduced to a narrow vertical slit (Fig. 6). A similar change takes place when the hydronephrosis is of the "pelvic" type. Here the angle between the lower margin of the distended pelvis and the ureter becomes acute (Fig. 11).

It is possible that a similar change takes place in cases of movable kidney when the movement is of the "cinder sifting" type but I have not had an opportunity of demonstrating this.

2. *What is the position of the obstruction?* The presence of a stone in the renal pelvis or ureter will indicate the position of the obstruction. When no stone is present the collargol shadow may render assistance.

When the obstruction is at the ureteropelvic junction the shadow stops short abruptly at the pelvic outlet but when the obstruction is low down in the ureter it tails off as it passes down the ureter. Where the ureter is dilated a shadow of the collargol filled tube may be obtained, as Braasch has shown. In a case where the obstruction was due to a movable kidney I was able after nephropexy to show the dilated pelvis and the collargol passing down the ureter in waves, demonstrating the absence of obstruction and the contractile power of the ureter (Fig. 11). The presence of an opaque segment of the catheter (1 centimetre long) in the clear area of ureteral contraction showed the length of this wave of ureteral contraction to be about 2 centimetres.

3. *Is an abdominal tumor a hydronephrosis or is it unconnected with the kidney?* An abdominal tumor may in its

solution can be substituted. The real use of the collargol method is not, however, in these advanced cases but in the early cases when genuine difficulty in diagnosis exists.

There is said to be danger of injecting the whole kidney tubules and of causing rupture of the renal pelvis with the collargol solution.

On examining the basis for this statement it will be found that the condition was produced on the dead body with the exception of one case (Oehlecker), where it occurred in a child of ten years. In this case the fluid was "injected under high pressure." Were this fact not definitely stated, I would have considered it superfluous to insist upon the utmost gentleness of manipulation and delicacy of touch in everything connected with ureteral and pelvic work of this nature. If this cannot be guaranteed, the surgeon had better leave such methods alone.

I did not "inject" the collargol solution. It is run in by raising the small glass receptacle six or twelve inches above the level of the urethra.

Further, anaesthetics should be avoided as pelvic pain is a valuable guide to the surgeon and one that should receive instant attention.

Finally a fatal case has been recorded by Roessle where "cauterization of the entire mucous membrane of the kidney pelvis and inhibition of the pyramids with collargol" (Blum) was found. This case was quite exceptional.

I have operated upon a considerable number of cases within a week of the collargol injection and have found the mucous membrane of the pelvis healthy and glistening even where the contents of the pelvis were still deeply stained with collargol.

In a recent case I performed nephrectomy two days after an examination with a 20 per cent. collargol solution. Microscopical examination of the mucous membrane of the renal pelvis showed the epithelium normal in appearance.

So far as I am aware no such cauterization as that recorded by Roessle has occurred in the experience of other observers. I have to thank my colleague Dr. Ironside Bruce, radio-

CASE V.—F. M., an engineer's fitter, aged forty-three, suffered from slight pain in the right loin and across the base of the sacrum and from difficult micturition for six or seven years. The difficulty in micturition was intermittent. It was worse when the pain was present and better when it was relieved. The pain came on in attacks with intervals varying from 14 days to 12 months. It radiated along the line of the right ureter into the right testicle and down the right thigh and might last for a week at a time. Occasionally there was pain in the left loin. There was no haematuria but the urine contained pus. He passed water every three or four hours during the day and occasionally once at night. The kidneys were not palpable or tender.

The X-rays showed an oval calculus of moderate size on the right ureter at the level of the brim of the pelvis. An opaque bougie was passed up the right ureter. There was a hitch at the level of the pelvic brim and the catheter passed on into the renal pelvis. Collargol was introduced and practically no sensation was felt in the kidney by the patient.

In the skiagram the ureter is seen to pass outward from the level of the fifth lumbar vertebrae to join the neck of the pelvis which lies vertically just outside the tips of the transverse processes of the second and third lumbar vertebrae.

The pelvis is vertically placed and is of the funnel-shaped variety becoming gradually larger as it passes upward. The pelvis does not appear to be dilated and is not in any way distorted. It gives off four large branches, the upper of which passes upward and outward, the next two directly outward and the lowest directly downward.

These branches are long and gradually expand into a rounded or clubbed extremity which reaches to the surface of the shadow of the kidney. They are separated by broad wedges of renal substance. The lowest expanded branch which passes vertically downward lies close to the neck of the pelvis and is only separated from it by a narrow space so that the two shadows meet in an acute angle. The kidney shadow is slightly increased in breadth.

In a radiogram of the pelvis a broad band of collargol shadow is seen lying transversely across the pelvis and represents a

Urea was determined in all of the earlier work by means of the Doremus method. In some of the later cases, however, Marshall's<sup>3</sup> new area method was utilized.

The phthalein test was utilized according to the technic described in previous communications, except that the drug was given always intravenously and collections made for 15 minutes or half-hour periods.

In forty cases fifty diastase determinations were made. The general result coincides fairly well with those of Wohlgemuth in that in the majority of instances the diseased or more diseased kidney is correctly indicated through the decreased diastatic activity of the urine from that kidney. Where the various tests harmonize no comment is necessary. One case, however, is of sufficient interest to justify a detailed report, because it afforded an opportunity for an extensive and prolonged study of function and also the opportunity to observe the effect of a pyelotomy on the function of the operated kidney, as well as the effect of this procedure and of the anæsthetic on the function of the other kidney.

There was complete blockage of the right ureter, the urine draining from a renal fistula, the result of an operation for a calculus seven years previously. The urine only from the left kidney passed through the bladder. This kidney contained in its pelvis a large calculus which was associated with a slight infection.

The total function was practically normal, 41 per cent. phthalein for one hour. All three tests indicated the left kidney to have a functional capacity double that of the right. At operation under gas and ether anæsthesia a large bifid kidney was encountered on the left side, the lower half showing a marked hydronephrosis, the upper half, healthy kidney tissue equal to the size of a normal kidney. The stone lay in the pelvis of the lower half and was removed through an incision in the pelvis (Dr. Young). Although no dissection was done to determine the exact anatomical condition present, it seemed very evident that the kidney had a double pelvis, the stone lying in the lower one, the upper pelvis entering into a common ureter below the stone and being consequently free of obstruction. This upper

On July 15, 1911, I exposed the right kidney and found a thin hydronephrotic sac of large dimensions adherent to the diaphragm above and extending into the iliac fossa. The ureter was normal in size. The calculi were removed and the obstruction was found to lie at the junction of ureter and pelvis but so buried in fat and fibrous tissue as to be inaccessible. I therefore brought the ureter up to the lower end of the kidney and formed a short circuit between the cavity at the lower pole of the kidney and the lumen of the ureter by lateral anastomosis. The patient is well and at work at the present time (April, 1913).

*3. A stone has been passed from the kidney some years previously and there is recurrent pain but no calculous shadow. Is there stenosis of the pelvic outlet and commencing dilatation of the kidney? (Fig. 2.)*

CASE VII.—The patient, aged twenty years, had had a stone crushed by the late Mr. Reginald Harrison at the age of six years after suffering from left renal colic. For the last five years he had had pain at the end of the penis on passing urine and this had increased during the last month. The frequency of micturition was increased to two hours during the day and there was some urgency. On exertion he had pain in the left side which he localized to the region of the left kidney. The left kidney could not be felt and was not tender.

The radiographer's report was that there was no opacity from calculus, but that there was some increase in the opacity of the left flank, whether due to the enlargement of the left kidney or not, was doubtful. On cystoscopy there was basal cystitis and a patch of cystitis on the right wall of the bladder. The right ureter was open with thick edges, but contracted wall, and the efflux was clear; the left ureter was large, open, oval and did not contract. The efflux was not seen. It was probable in this case that there was some dilatation of the left kidney due to the passage of a calculus some years previously and that the dilatation might be due to progressive contraction at the ureteropelvic junction.

An opaque catheter was passed up the left ureter and warm collargol slowly introduced. Pain was felt at 7 c.c. and a radiogram was taken. The plate shows the shadow of a dichotomous pelvis with calyces. The highest and lowest calyces are clubbed

diastase failed to reveal any differences in function. Total diastase, however, would be more in accord with the true functional condition, but this furnishes no information other than is available from phthalein and urea. Case XXVII is another instance of the same phenomenon.

In two other cases which clinically presented no signs or symptoms of renal disease, a marked difference in function on the two sides was indicated (Cases XIV and XX).

These six cases serve to demonstrate that diastase is not an infallible index of relative functional capacity, since in two apparently normal cases considerable differences existed between the two sides, in two cases a definite lesion was not indicated, in another the functional injury was exaggerated, while in the sixth case unless the quantity of urine was taken into consideration an erroneous impression of function was given.

The diastase is of very considerable value, however, in the majority of cases. It is about equal in value to urea per cent. In some cases it may be of even greater value than urea per cent. because of the fact that it is not so readily affected by dilution. In the cases of free urinary secretion, which are usually cases without ureteral inhibition, the phthalein gives much more accurate information and in such cases diastase and urea are of minor value only.

The employment of functional tests in association with ureteral catheterization is attended with two great difficulties which in certain cases make it impossible to obtain all desirable information from any one test: (1) Inhibition of function and (2) leakage around the ureteral catheter.

*1. Inhibition.*—Any discrepancy due to inhibition can be detected readily through the determination without ureteral catheterization of total renal function by phthalein and error can thereby be avoided. For instance, with a total phthalein excretion normal or nearly normal, one kidney at least is normal or practically so. If, in such a case, on ureteral catheterization one should find on one side decreased function, which under ordinary conditions would be an indication for

A radiogram (Fig. 9) taken by Dr. Ironside Bruce showed the following:

The ureter lay in normal position across the transverse processes of the bodies of the fifth to the second lumbar vertebræ. The line of the upper end of the ureter is continued straight into that of the neck of the pelvis.

The pelvis lay opposite the intervertebral disc between the first and second lumbar vertebræ. It was of the single funnel-like type and split into four calyces. The upper calyx continued in a gentle curve the line of the upper end of the ureter and the neck of the pelvis.

The angle between the lowest calyx and the neck of the pelvis was wide and formed a full curve. There was no dilatation of the pelvis, no clubbing of the calyces. The outline of the kidney was normal. By this examination it was proved that no dilatation of the renal pelvis or calyces was present. At the urgent request of the patient I operated to fix the movable kidney.

The fascia of Zuckerkandl was thick and the perirenal fat absent except at the hilum. Tough fibrous bands passed from the fibrous capsule to the perirenal fascia. The pedicle was long and the kidney readily delivered through the wound. The pelvis was small and there was no hollowing of the kidney. Nephropexy was performed.

5. *Nephropexy has been performed some years previously and there is aching pain in the loin. Is there dilatation of the kidney? (Fig. 3.)*

CASE IX.—B. F., a spare woman of thirty-six years, had suffered from movable left kidney for which nephropexy had been performed ten years previously.

For the last five years there has been dull aching in the left loin and all over the left side. This occasionally became acute but never radiated to the groin or labia. She occasionally vomited during an attack of pain. The urine was always clear. Urine was passed every two hours during the day and every half hour during the night for several months. There was some difficulty in passing water when the pain was acute and when the pain ceased a large quantity of water was passed. The pain was worse after exercise. The right kidney was not palpable or tender. The left loin was a little tender, but the kidney was not palpable. On cystoscopy, the bladder and

age does occur and sometimes in amounts sufficient to nullify the findings. Unless one repeats the catheterization, which is not always practicable, using the Garceau catheter on one side along with transvesical collection for the other, knowledge of the relative functional values must be largely obtained from urea per cent., diastase and time of appearance of phthalein. This was well illustrated in a case with normal kidneys in which so much leakage occurred that the estimation of the relative function from phthalein was impossible, but the diastase, urea per cent. and phthalein appearance time all indicated identical functional capacity on the two sides.

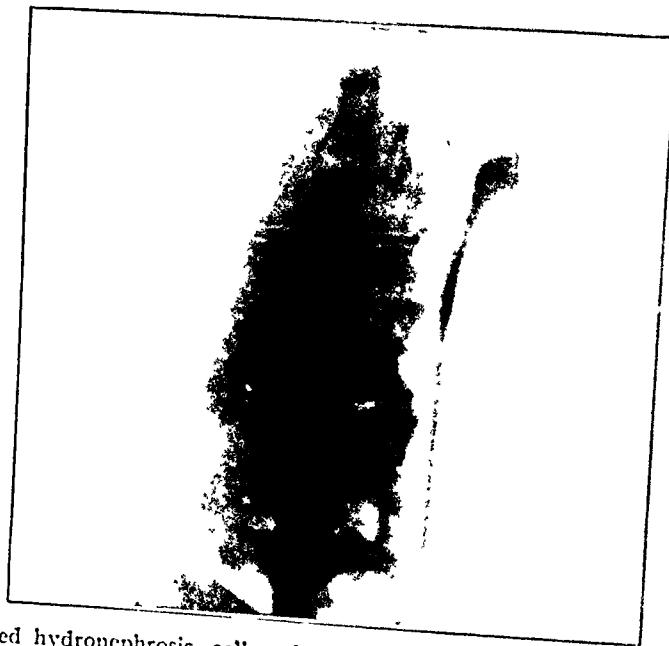
*Combination of Tests.*—The number of tests has increased to such an extent that the use of all of them is impracticable. It becomes necessary, therefore, to consider what tests are really necessary for all of the available information under all conditions. In order to make a judicious selection it is necessary that one be familiar with the peculiarities, advantages, disadvantages and limitations of each and all of the approved tests.

Interpretation of findings is not always easy but in order that this may be made simpler, our ideas relative to the indications for the employment of any one of these tests alone or in combination, together with the significance of their findings, are here presented.

*The phthalein test* is incomparable so far as total function is concerned and gives information frequently unavailable from any other source, and in cases in which leakage and inhibition are absent furnishes in itself all the information necessary in regard to the function of each kidney. The absolute on each side as well as the relative function is revealed.

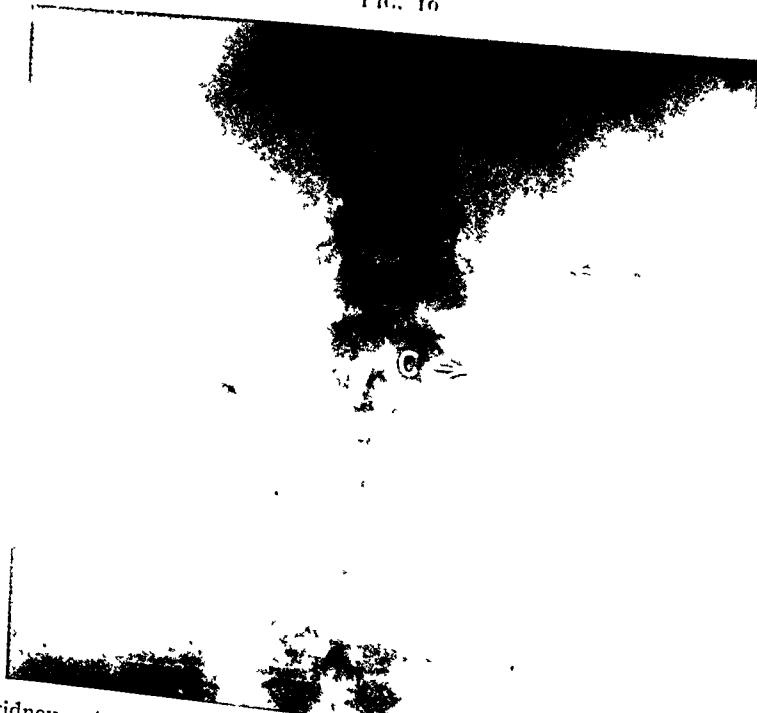
It is advisable to give the phthalein intravenously and to make collections for one-half to one hour periods when an accurate quantitative knowledge of the function of each kidney is desired, because as was previously pointed out, short periods of collection are not reliable. In the majority of in-

FIG. 9.



Case of supposed hydronephrosis, collargol shadow showing normal pelvis with calyces.  
Opaque catheter in ureter.

FIG. 10



Movable kidney. A, B, opaque catheter in ureter; C, kink at ureteropelvic junction; D,  
dilated calyx.

little time. The diastase while exceedingly simple is time consuming. Freshly prepared soluble starch solution is needed anew each day and at least a half hour actual time is necessary for each test.

#### CONCLUSIONS.

1. That diastase is of value in the majority of cases in indicating which is the diseased or more diseased kidney
2. That in the majority of instances it is not necessary and adds nothing to the information obtainable from the phthalein or urea determinations which are more easily made.
3. That in cases with leakage or serious catheter inhibition, but where sufficient urine to allow a diastase determination has been obtained, the test is of value.
4. That dilution affects the urinary diastase content to a less extent than it does urea per cent.
5. That dilution is not a negligible factor in regard to this test, total diastase content being at times of greater importance.
6. That neutralization of the urine is not a negligible factor in the technic of the test.

#### REFERENCES.

<sup>1</sup> Wohlgemuth: Zeitschr. f. Urologie, 1911, 5, p. 801.

<sup>2</sup> Rowntree and Geraghty: Jour. Phar. and Exp. Therapeutics, vol. i, 1910, p. 579; Archiv. Int. Med., 1912, 9, p. 284.

<sup>3</sup> Marshall: Jour. Biol. Chem., 1913, xv, p. 487.

takes a sharp curve outward as it expands into the pelvis of the kidney. The upper calyx of the pelvis is very distinctly dilated. I explored the kidney on March 15, 1911, and found an elongated kidney which was fixed by a band of fibrous tissue of the size of a shilling, to the tissues in the inner surface of the twelfth rib. This band allowed some amount of vertical movement, but the chief movement consisted in the lower pole of the kidney swinging toward the middle line. There was hollowing of the kidney which was most pronounced at the upper part. There was no narrowing of the ureter or ureteropelvic junction.

I looked upon the swinging movement as the cause of the angling of the ureteropelvic junction and dilatation of the upper calyx. The kidney was freed, the capsule stripped from its anterior and posterior surfaces, and the organ slung vertically by three catgut stitches, placed at intervals of an inch, both ends of the highest being passed through the intercostal muscles between the eleventh and twelfth ribs and tied.

In this case pyelography showed that the upper calyces were dilated, and confirmed the view that this was due to the abnormal position and the movement of the kidney.

#### 7. Examination of a dilated movable kidney after nephropexy showing an openly actively contracting ureter (Fig. 11).

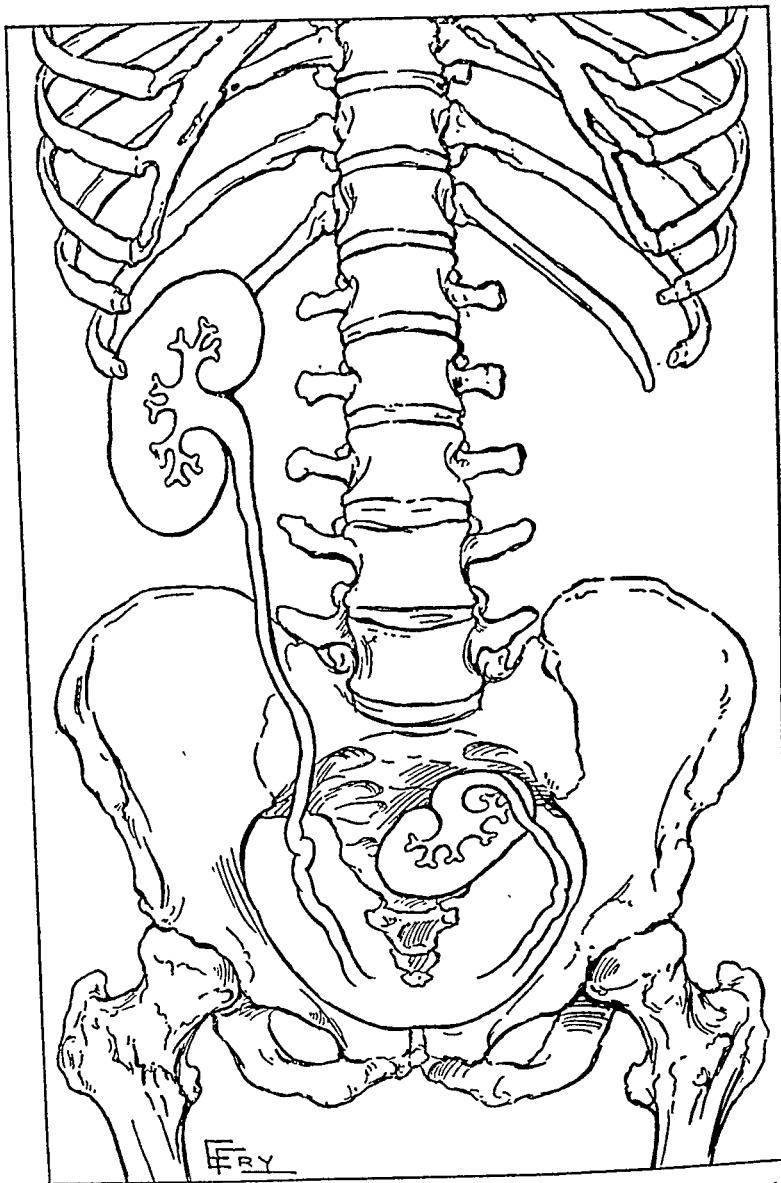
CASE XI.—E. A., a servant maid aged twenty years, had suffered from pain in the back and right side for two years. She experienced the sensation of a lump in the side and there was an occasional attack of lumbar pain more severe on lying on her back. There was no history of Dietl's crises or of variations in the quantity of urine. The right kidney was freely movable and could be displaced into the right iliac fossa. It was not enlarged or tender.

Nephropexy was performed in February, 1912. The fascia of Zuckerkandl was thick and the perirenal fat entirely wanting. Tough fibrous bands passed between the thickened fibrous capsule and the fascia. The kidney lay in the iliac fossa with its upper pole below the level of the iliac crest. The kidney pelvis was large and flabby and the kidney sinus admitted three fingers. Nephropexy was performed by partial decapsulation and catgut suture. The kidney was examined by pyelography three weeks after the operation. Collargol entered the pelvis easily and there was no pain. The pyelogram (Fig. 11) shows a greatly distended

tender to the touch. Slight thyroid enlargement. X-ray negative. Patient well nourished, but nervous.

Because of the congenital anomaly of the genital organs

FIG. I.



Outline drawing of radiogram following injection of colloidal silver into the kidney and ureters. Note position of left kidney in bony pelvis. Normal position of right kidney.

without history of menstruation, the patient was referred for cystoscopic examination. Cystoscopy showed the urethra and

When I examined him both kidneys were palpable, but neither was tender or enlarged. On cystoscopy the left ureteric orifice was larger. The efflux from both was clear. A catheter passed up the left ureter without meeting any obstruction. After injecting 28 c.c. collargol there was some pain. A radiogram (Fig. 12) shows a large oval collargol shadow opposite the bodies of the second and third lumbar vertebræ. The long axis of the oval runs parallel to the edge of the psoas muscle and a rounded projection overlaps the edge of this muscle at the level of the intervertebral disc between the second and third lumbar vertebræ. No calyces are visible. The shadow extends outward almost to the twelfth rib. The ureter contained no collargol. A diagnosis of hydronephrosis due to obstruction at the ureteropelvic junction was made.

On exposing the kidney I found a large lobulated kidney and a greatly distended renal pelvis. A band containing a large artery and vein passed across the ureter immediately below the distended pelvis and entered the hilum at its lower part. Below this band the ureter was normal in size. Above the band a little more than an inch of ureter was dilated and bound down to the surface of the dilated pelvis. The pressure of the band upon the ureter was clearly made out. On raising the vascular band on an aneurism needle, the ureter still remained adherent to the surface of the pelvis and the contents of the pelvis could not be made to pass into the ureter. The pelvis was opened on its anterior surface and the interior inspected. The opening of the ureter into the pelvis readily admitted a probe and there was no valve or stenosis here.

The probe passed down for about three-quarters of an inch and was then arrested. The aberrant vessels were now tied and cut across, but the probe did not pass. The ureter was dissected off the surface of the pelvis and at once the probe passed on, so that the actual obstruction was due to the adhesions. No blanching of the kidney followed ligature of the abnormal vessels. The wound in the pelvis was closed with catgut and the kidney fixed to the posterior abdominal wall with catgut sutures. Convalescence was uninterrupted.

9. *A diagnosis of hydronephrosis has been made. Pyelography shows the renal pelvis normal in outline and position.*

## MYOMA OF THE STOMACH.

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AND

LOGAN CLENDENING, M.D.

TUMORS of the stomach, other than carcinoma, have been somewhat infrequently reported. Sarcoma is the most common: there are now over two hundred cases in the literature (Zeische and Davidsohn<sup>1</sup> and Briggs<sup>2</sup>). There are many specimens of papilloma and adenoma of the stomach in collections; they have largely been secured at autopsy and seldom have clinical significance. Lipoma<sup>3</sup> and fibroma<sup>4</sup> have been recorded. Leiomyoma of the stomach is much rarer. We have recently had a case of myoma of the stomach the record of which follows:

ABSTRACT OF HISTORY.—*Male patient, nine years old. Complaint, vomiting and general abdominal pain. A tumor in the epigastrium. Gastro-enterostomy June, 1912. Gastrectomy February, 1913. Tumor at the pylorus and involving a third of the stomach, microscopically a leiomyoma. Patient made a good recovery. X-ray study of the stomach with a bismuth meal after the operation.*

C. P., male, nine years old, the second child of his mother, was first seen on May 31, 1912. His father and mother were healthy; they are third cousins. They have one other child who is perfectly healthy.

The patient had an attack of erysipelas at the age of one and one-half years; and at the age of six a small right inguinal hernia was noticed which subsequently disappeared.

Otherwise he had always been healthy until two years ago, when he began to vomit at frequent intervals for days at a time. The vomiting was accompanied by general abdominal pain. During an attack of vomiting he was confined to his bed; between attacks he was up and about, leading the ordinary active life of

The liver contained numerous large cavities filled with cysts and these were drained. Recovery was uninterrupted.

10. An abdominal tumor is present in the right loin. Pyelography shows the renal pelvis and calyces normal and situated high up above the tumor. At operation the swelling is found to be the right lobe of the liver and gall-bladder full of gall-stones. CASE XIV.—A. S., aged forty-two years, had suffered from attacks of pain in the right side of the abdomen and right iliac fossa for a year. The pain was very severe lasting for a few hours to a day and was accompanied by sickness and constipation. There was said to have been haematuria with the first attack, the blood being present in the urine for a week. At the commencement of the first attack the patient was said to have been jaundiced for two or three days, but this has not been noticed since.

There was a swelling on the right side of the abdomen extending from the costal margin to the iliac crest and inward to the middle line. The swelling was rounded on the surface and there was no sharp edge. It did not pass back into the costo-muscular angle. The urine showed evidences of chronic interstitial nephritis and there was a high blood-pressure and changes in the heart and arteries. Pyelography was performed without difficulty there being a remarkable absence of pain when the renal pelvis was full of fluid. The renal pelvis and calyces were normal (Fig. 14) and the kidney was situated high up under the ribs well above the prominent part of the tumor. The abdomen was opened. The right lobe of the liver was dragged downward and inward and its margin concealed by masses of adhesions. The gall-bladder was packed with gall-stones and extensively adherent. The gall-stones were removed from the gall-bladder and cystic duct and the adhesions freed. Recovery was interrupted by an attack of haematuria resulting from an exacerbation of the chronic nephritis.

11. A tumor in the left loin is suspected to be renal. Pyelography demonstrates the pelvis and calyces normal and situated above the mass which is found on operation to be a mixed celled sarcoma of the perirenal tissue (Fig. 15).

CASE XV.—M. T., aged fifty-nine years, gave a history of "inflammation of the bladder" three months previously followed by dull aching pain and tenderness in the left loin. She then felt a "lump" in the left side which was heavy and tender.

curvature and front and back walls of the stomach. Fig. 1 is a side view of it with the pylorus cut open, the surface of the gastric mucosa above. Fig. 2 shows the mass bisected and the cut surfaces of the two halves. The dark spot at the lower pole is a cyst with smooth walls which was filled with brownish fluid. The white surface above this was firm and dense. The gastric mucosa was everywhere intact and freely movable over the surface of the tumor. The serosa also was intact and movable so that the neoplasm occupied the middle coats of the stomach.

*Microscopic Appearance.*—Sections made through the firm white part of the tumor showed everywhere parallel bundles of smooth muscle fibres interlacing in all directions. In many parts there was some round-celled infiltration between the individual fibres. Although all relations here were lost it must have sprung from the muscular coat. With the Van Gieson stain it was seen that although there were many fibrous elements the muscle cells were in great preponderance (Figs. 3 and 4).

On February 21, 1913, he was given a bismuth meal and its progress watched with the X-ray. The bismuth entered the stomach very slowly and remained for some time above the cardia, trickling into the stomach slowly. After its entrance it settled in six to seven minutes in the lower pole of the stomach in a small mass and then began to leave the stomach by the gastro-enterostomy opening. Respiration facilitated the passage of the food into the intestine. The stomach was nearly completely empty in twenty minutes. Fig. 5 is a plate taken at the time the bismuth was beginning to leave the stomach after a second glass of buttermilk containing bismuth oxychlorid.

The literature upon myoma of the stomach is not large. The earliest collective report we have found is Steiner's,<sup>5</sup> who reported twenty-one cases of myoma and myofibroma of the stomach. Thompson<sup>6</sup> was able to collect forty-three cases which had only pathologic interest, and twenty cases of clinical interest. Of these, two (Moser's<sup>7</sup> and Capello's<sup>8</sup>) are reported as myosarcomata. Thompson then had eighteen clinical cases of leiomyomata or fibromyomata. To these he added one operated case.

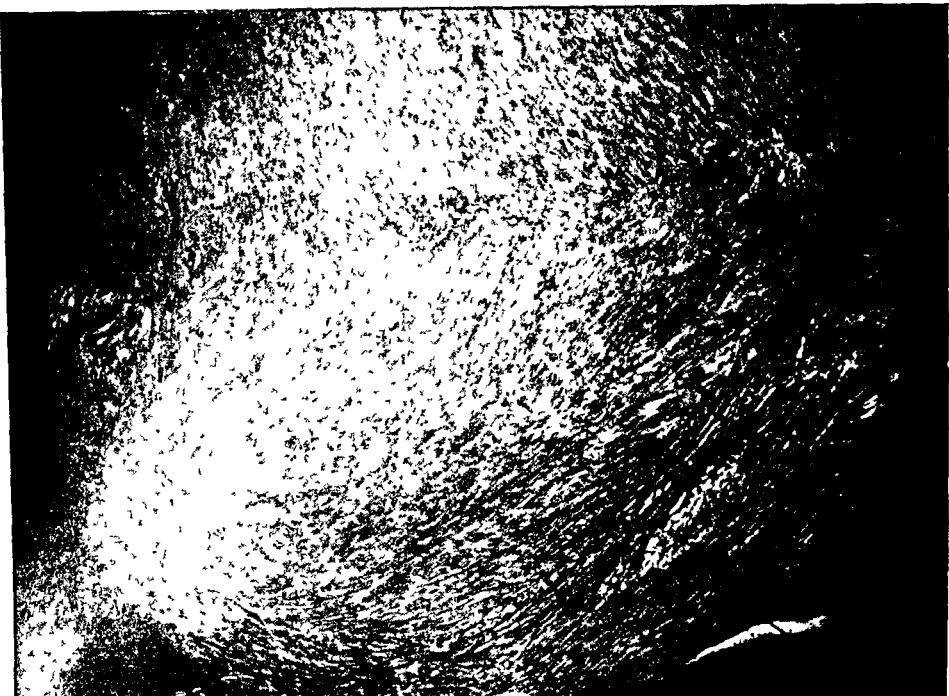
Kosinski's<sup>9</sup> case is the earliest reported—a male aged fifty-seven who had a tumor in the abdomen with symptoms extending over three years. Three days after aspiration of fluid from the abdomen he collapsed and died. At autopsy a tumor weighing twelve pounds was found attached to the greater curvature.

I have on two occasions failed to obtain a shadow on the first attempt. When the absence of a shadow was discovered the operation was immediately repeated and in each case was completely successful, one of the plates being as good as any that I have obtained. In both cases an opaque catheter was used and the first plate revealed the fact that the ureteric catheter had been pulled out in withdrawing the cystoscope and did not reach beyond the brim of the bony pelvis. As a result the collargol solution had escaped downward into the bladder. It is important, therefore, to use an opaque catheter and one which is marked in segments easily read by the unaided eye, so that the surgeon may know on introducing the catheter how far he has passed it up the ureter. The eye of the catheter should be within the renal pelvis and the distance which the catheter must travel up from the ureteric orifice is usually twelve or twelve and a half inches. Further, care must be taken to avoid pulling on the catheter during the removal of the cystoscope.

In a third case, the only other failure that I have had, there was an interval of over ten minutes between the introduction of the collargol and the taking of the radiogram. During this time the collargol had escaped down the urethra outside the catheter for the plates showed the catheter in good position and the collargol shadow in the bladder.

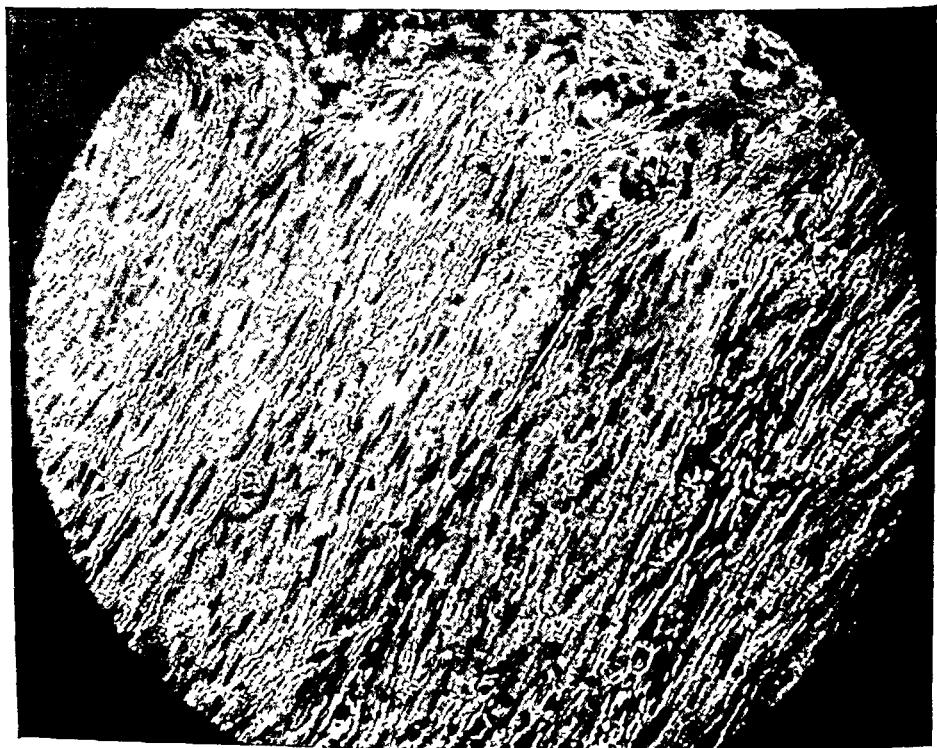
In one case I did not at first discover a shadow and thought that the collargol had failed to show on the plate. On further search I found, however, that there was the shadow of a normal pelvis lying on the shadow thrown by the ileum—and partly obscured by it. Dr. Blum<sup>5</sup> states that the method is useless in closed hydronephrosis. The objection cannot be a very serious one. Completely closed hydronephrosis is in my experience a rare condition and is one in which the diagnosis is seldom in doubt. The application of the collargol method to it is rather of academic than of practical interest. In the temporary closure of an intermittent hydronephrosis the ureteric catheter after a slight hesitation passes on into the sac, the contents can be emptied, and if desired, collargol

FIG. 3.



Microphotograph of a section made in the dense part of the tumor. (Low power.)

FIG. 4



High power of a portion of Fig. 3.

a result of these studies it was learned that the employment of all of the tests in any one case was impracticable, time consuming and also unnecessary, since the urea and phthalein furnish all available information. In a series of 40 cases the study of the phthalein output, of the urea per cent., total urea, and diastase from each kidney is here presented, an effort being made to determine the relative reliability and practicability of these tests as well as to ascertain what advantages, disadvantages and limitations pertain to each.

*The Technic Employed.*—The diastase has been determined according to the original technic of Wohlgemuth which is as follows: After neutralization, the same amount of urine from each side is placed by means of an accurately graduated pipette in a series of twelve test tubes in amounts decreasing from 0.6 c.c., 0.5-0.1-0.04 c.c. A sufficient quantity of 1 per cent. NaCl solution is then added to bring the amount of fluid in each tube up to 1 c.c.<sup>1</sup> To each tube is added 2 c.c. of a 1/1000 solution of freshly prepared soluble starch. The tubes are immersed in a water bath at 38° C. for 30 minutes after which they are placed in cold water for 3 minutes. To each tube is added sufficient 1/50 N. iodin solution to elicit a permanent color, violet or blue occurring where digestion is not complete. The tube in each series immediately preceding incomplete digestion of the starch indicates the diastase content of that particular urine and from this the *d* is calculated. *d* is the diastatic activity expressed as the number of c.c. of 1/10 per cent. starch solution capable of being digested by 1 c.c. of the urine utilized.

It might be emphasized that neutralization of the urine is important. In one case in which the urine on the left side was extremely alkaline, determined on the unneutralized sample, *d* was 4, whereas after neutralization it was 20. Although an extreme case this indicates the necessity of neutralization in every instance.

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<sup>1</sup> One c.c. of urine was diluted to 10 c.c. and from this diluted urine the measurements of the amounts less than 0.1 c.c. were made.



hypertrophied kidney tissue explained the presence of the practically normal total function in the presence of these severe bilateral renal lesions.

The day after the operation (the right kidney not having been disturbed) the function of the right kidney dropped to one-half its previous capacity, while that of the left dropped to one-third, the function of two sides being now identical. The time of appearance from the right was 40 minutes as compared to 15 minutes prior to operation. The function of each kidney gradually improved until at the end of three weeks the level which existed previous to operation was reached.

In certain cases differences in functional capacity, as indicated by these various tests, exist, a consideration of the details of these differences furnishes information as to the relative value and limitations of each test.

In Case I there was a slight grade of pyelonephritis of the right kidney and some hydronephroses. The phthalein indicated the function of this kidney to be half that of the left, while the total urea indicated identically the same ratio. The diastase, however, showed a very much greater function on the left than on the right side, and when the greater quantity of urine from the left side is considered this disproportion would be even more exaggerated. The phthalein and total urea appeared to be more in accord with the clinical findings. In this instance the urea per cent. was of no value.

While from our results it is quite evident that differences in diastase are not so readily caused through dilution as differences in urea per cent., dilution in relation to diastase is not a negligible factor as is exemplified by one of our cases. In Case XI, a slight left-sided pyelitis, the phthalein was equal from the two sides, indicating equal function. This was corroborated by the total urea. The diastase showed a marked difference on the two sides. But if corrected for dilution the total diastatic activity would be practically equal. In the presence of an unmistakable tuberculosis of the left kidney (Case XXXVI) in which the decreased function was indicated by phthalein, urea per cent. and total urea, the

the tumor was the size and shape of a small sausage and sprung from the greater curvature; at operation it was supposed to be an intussusception and removed with a part of the stomach; the surgeon discovered his mistake and reopened the abdomen but the patient died.

Peugniez and Jullien<sup>28</sup> report two cases: one in a woman aged thirty-seven who for five years had attacks resembling acute appendicitis; at operation a small hard myoma was found at the pylorus, which was excised with recovery. The other was of a woman aged fifty-seven who had had symptoms of pyloric obstruction at the age of twenty-two and at the time of presenting herself for operation had vomiting, epigastric rigidity and retention of food. A diagnosis of gastric cancer was made and a laparotomy revealed a hard tumor encircling the pylorus; a pylorectomy was done and resulted in a recovery.

Mouriquand and Gardere<sup>29</sup> had a patient aged sixty-seven who entered the hospital for œdema and cardiac irregularity and died in a uræmic convulsion; at autopsy a large myoma was found on the posterior wall of the stomach.

Lowit<sup>30</sup> operated upon a woman forty-eight years old who suffered with diffuse abdominal pain. An elastic tumor presenting in the hypogastrium had been noticed for a year gradually growing until at the time of examination it was the size of a man's head. On opening the abdomen a cystic tumor containing 1.5 litres of fluid was found attached to the greater curvature near the pylorus. Microscopically it was a lymphangiectatic myoma. The patient left the hospital in two weeks.

Bullock<sup>32</sup> reports two cases in females aged sixty-three and fifty-six.

Anitschaff<sup>33</sup> reports three museum specimens all located at the junction of the stomach and œsophagus.

Farr and Glenn<sup>34</sup> report a case in a woman aged forty-nine who had profuse haematemesis and died shortly after. At autopsy a myoma was found in the fundus of the stomach. Farr and Glenn collect 84 cases but they include many cases of adenomyoma and myomata in association with carcinoma; all the reports of this sort that we have investigated have been of doubtful value.

There are then seventy-nine cases now on record including the one here reported. Of these twenty-eight have come to operation, or have been of clinical interest. The condition is usually considered to be carcinoma before operation and sarcoma at operation, until the microscopic examination is made. Sherren,<sup>31</sup> in collecting eighteen cases of polypoid tumor arising from the greater curvature of the stomach, states that often they are myoma malignum, and present as cystic tumors in the midline. These cases are similar to the cases of Kasinski, Lowit, Battey and Spencer.

nephrectomy even though the function of the supposedly healthy kidney as estimated with the aid of the catheter showed an apparently dangerously low excretion on account of the inhibition, one need not hesitate about removing the diseased kidney. The low function here is clearly the result of inhibition, the extent of which is indicated by the discrepancy between the separated functions and the total function without ureteral catheterization.

In cases of bilateral tuberculosis, the amount of pus from each side being practically the same, the phthalein can demonstrate that one kidney has a function far in excess of the other—a function sufficiently good to allow of successful nephrectomy. However, in certain instances inhibition might be so marked and the elimination of phthalein from each side consequently so small that it might be impossible from phthalein alone to determine which is the better kidney. Here diastase and urea per cent. together with a difference in the intensity of urine pigment and a consideration of the total phthalein would be of value. No such instance, however, has yet been encountered. In the majority of cases the influence of inhibition can be minimized through longer collections ( $\frac{1}{2}$  to 1 hour).

Occasionally owing to extreme nervousness on the part of the patient or on account of unusual pain attending the presence of the catheter in the ureter, the time of catheterization must be curtailed to such an extent that an accurate quantitative determination of function is impossible. Here one is obliged to secure all of the necessary information from microscopical and clinical data and from urea per cent., time of appearance of phthalein and possibly of diastase, provided sufficient urine has been excreted to allow the application of the tests.

2. *Leakage*.—In order to obtain an accurate quantitative estimation of the function of each side it is necessary to secure complete collection of the urine. By the use of Albaran's flute end catheter this is usually possible. In a certain proportion of cases, especially those with relaxed ureters, leak-

## PRIMARY SARCOMA OF THE LARGE INTESTINE.\*

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*Statistics.*—A somewhat careful survey of the material at my disposal shows a dearth of literature upon this subject until quite recently. According to Baltzer,<sup>1</sup> Stort found no cases in the reports of the Berlin Pathological Institute from 1859 to 1875. Undoubtedly many of the early cases were confused with other conditions and thus remained unrecognized.

Jopson and White,<sup>2</sup> in 1901 (*American Journal Medical Sciences*, v, 122), after a careful review, were able to find only 22 cases of sarcoma of the large intestine; and in 5 of these there was some doubt as to the growth being primary in the large bowel. In only 14 cases was the growth confined to the large bowel exclusively. Only 3 of this group were confined to the cæcum and ascending colon.

*Location.*—While in carcinoma of the intestine perhaps 95 per cent. occur in the large bowel, in sarcoma only about 35 per cent. are found there.

Corner and Fairbanks<sup>3</sup> collected 175 cases of sarcoma of the alimentary tract (exclusive of the mouth, pharynx and anus), with the following distribution: Oesophagus, 14; stomach, 58; small intestine, 65; ileocæcal, 20; colon, 11; rectum, 7.

G. A. Hamann<sup>4</sup> (*Surgery, Gynecology and Obstetrics*, September, 1909), in 1909, was able to find 4 additional cases.

We could only find 3 cases of sarcoma of the cæcum and ascending colon reported up to the time that I operated upon my case. The colon is most apt to be affected in childhood.

W. J. Mayo<sup>5</sup> in 1909 reports resecting twice for sarcoma of the intestine, in a paper on "Tumors of the Cæcum."

S. Goto,<sup>6</sup> in June, 1911, collected 24 cases of ileocæcal sarcoma, exclusive of those of the appendix, and gave 1 of his own. He gives 5

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\* Read before the Minnesota Pathological Society, March 18, 1913.

stances, however, where it is necessary only to ascertain if the remaining kidney has a sufficiently good function to warrant operation, shorter periods (15 minutes) suffice.

In exceptional cases where marked inhibition or severe leakage occurs, diastase and urea per cent. may furnish most important information in conjunction with microscopical and clinical data. Diastase is subject to the same errors as urea per cent. except that it is not so readily influenced by dilution. The findings of either must be accepted with extreme caution and only when, for causes mentioned above, total urea and quantitative phthalein determinations are impossible.

The method of procedure which has furnished the greatest amount of information is as follows. In all cases demanding ureteral catheterization the total functional capacity is first determined by phthalein without ureteral catheterization. Where the total function is low a cryoscopy of the blood serum or a blood urea determination is made (Marshall's method). After ureteral catheters are in place and a flow of urine has become established the phthalein is given intravenously and the time of appearance on the two sides noted. Urine is then collected for periods of from 15 minutes to 1 hour starting from the first appearance of the drug, the length of the period depending upon the character of the information desired. Where leakage or inhibition of a grade sufficient to interfere with quantitative determinations does not occur, the quantity of phthalein from each side during a period of 15 minutes or preferably one-half hour is considered the index of the function of the individual kidney.

Total urea estimations almost invariably corroborate the findings of the phthalein as regards the relative function.

In the presence of considerable leakage dependence is placed upon the time of appearance of the phthalein, urea per cent. and diastase.

In the presence of inhibition the urea per cent. and diastase are the factors of greatest value taken in conjunction with the clinical findings.

*Practicability of Tests.*—The phthalein and Marshall's urea determinations are made with great ease and take but

reported by Jopson and White were explored, and only 10 could be resected. Of these 5 died. Two cases of the 11 sarcomas of the colon were resected and both died.

Involved abdominal lymphatics should be looked for, and removed; and in cæcal growths the rule of excising at least six inches of the terminal ileum should be followed, as its lymphatic drainage is identical with that of the colon.

*Report of Case.*—Mr. A. S., aged sixty-one, had been under the care of Dr. L. A. Nippert for acute inflammatory symptoms relating to the right upper abdomen during the previous two weeks, during which time he was confined to bed. This was the first attack of this kind that he had ever had. He describes his previous attacks as follows:

For about twenty years, with gradually increasing frequency, he had had attacks of partial obstruction, and after severe pain, and often vomiting, he would take a laxative and finally be relieved. There had never been any bleeding, but the stool had been dark at various times. Microscopic examinations for blood, by various physicians, had proven negative. A year or two previously a small tumor had been removed from the face, and pronounced by Dr. Corbett, who examined the growth, to be adenoma.

The skin presented a marked icteric tinge which was thought to be due to the gall-bladder condition. Local examination showed much rigidity in the right upper quadrant; and on deeper inspection a mass could be palpated in the right kidney region. The urine showed albumen, granular and hyaline casts, and decrease in quantity.

*Operation.*—Operation revealed a distended gall-bladder, greatly thickened, which was quickly drained, as the intestinal tumor had been explored and found to be operable. A classical resection, with lateral anastomosis by the method of Moynihan, was made. Several large glands were lifted out, with the growth, after mobilizing the bowel after the method of Lane. Drainage was employed on account of the gall-bladder infection.

The output of urine was 32 ounces during the succeeding four days; but convalescence was otherwise normal. Since that time his health has been excellent.

## REPORT OF A CASE OF PELVIC KIDNEY: DIAGNOSIS BEFORE OPERATION.

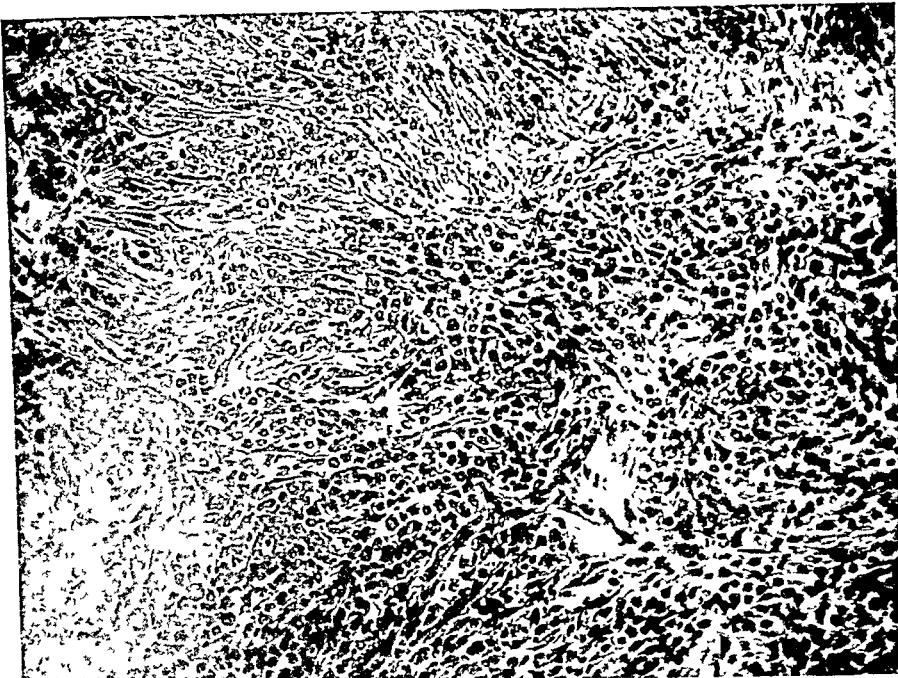
BY G. J. THOMAS, M.D.,  
OF ROCHESTER, MINNESOTA.

(Reported from the Mayo Clinic.)

As a means of diagnostinating congenital anomalies of the urinary tract the radiogram, following the injection of colloidal silver, is of great value inasmuch as it demonstrates accurately the position, size and number of kidneys, and the condition of the ureters. The following case report is an example in which this method was used and the diagnosis made before operation.

CASE A75609.—Mrs. P., aged thirty-two, married. Fourteen years previously the patient had been examined in the Mayo Clinic. At that time she had not menstruated. Physical findings: Vagina about one inch in length. No uterus, ovaries or tubes were discoverable upon palpation. Breasts normal and well developed. Family history: Eight sisters all having normal menses, five of them had married and borne children. Present history: Married seven years. No menses, but distress and pain over the region of the ovaries every two months. A year ago, following a cold or wet feet, she began to have attacks of frequent micturition. These attacks lasted six or seven days and then disappeared. She complains of a low abdominal pain, alternating from one side to the other, and she has been confined to bed for two or three days at a time with marked soreness and tenderness in the left pelvis. In sitting down and flexing the left thigh, and in leaning over, she has a severe sticking pain in the left side. She does not sleep well, cannot lie on her left side, is nervous and tires easily. Examination of urine (12 hour specimen): Specific gravity, 1018, 350 c.c., acid, no albumen, no sugar, an occasional red-blood cell. Objective symptoms: Vagina one inch long. No uterus palpable. Rounded mass about the size of an orange high in left inguinal fossa,

FIG. 3.



Microphotograph, times 500. Area showing numerous thin-walled vessels with slightly denser connective tissue bundles.

FIG. 4.



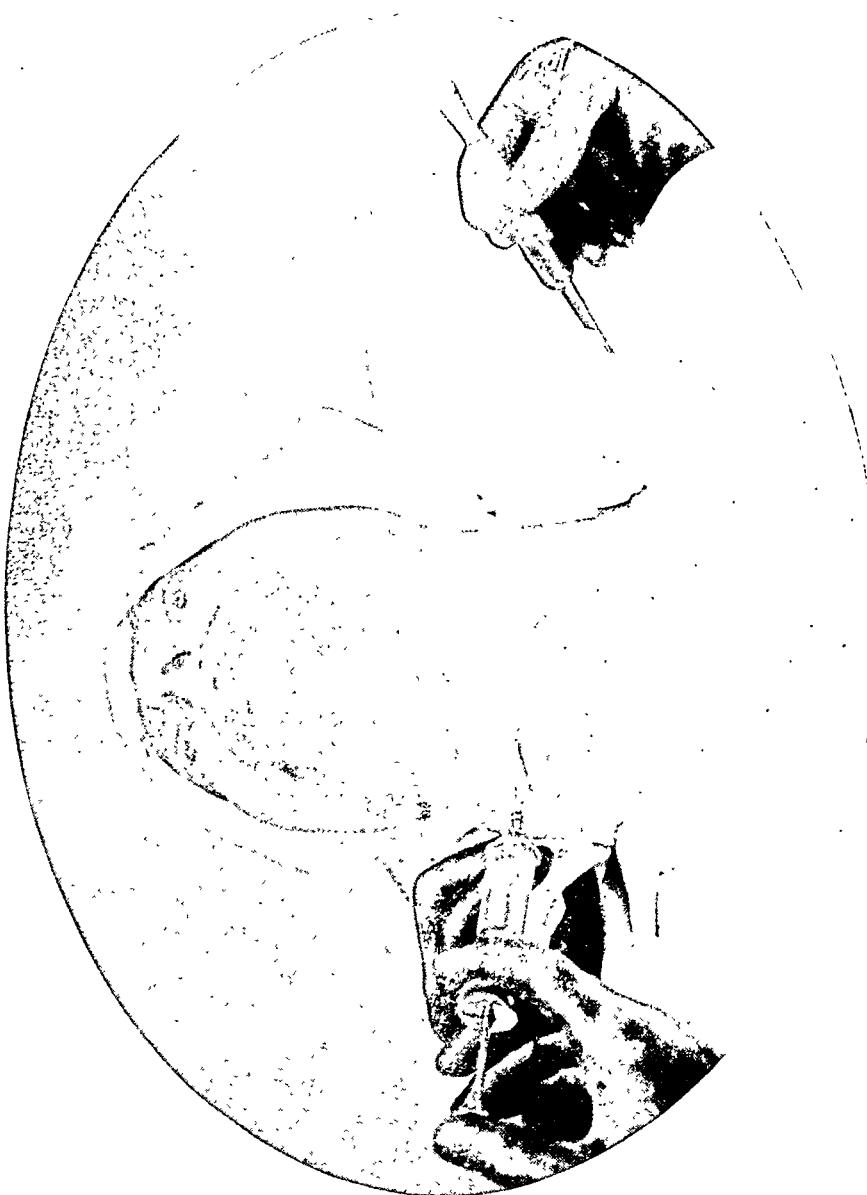
Microphotograph, times 400. Section of mucosa of colon with underlying tumor; submucosa is replaced by dense tumor tissue which has advanced to the bases of the mucus glands.

bladder to be normal. It was difficult to pass the left ureteral catheter more than 5 cm., or  $2\frac{1}{4}$  inches from the bladder. The right side appeared to be normal. Amount and character of the urine from the left side compared favorably with that from the right side. A double injection of colloidal silver by the gravity method was made and a radiogram taken. The passage of the cystoscope and the left ureteral catheter was so painful to the patient that the operation could not be prolonged long enough to give an intravenous injection for the purpose of making a separate estimate of the function of the two kidneys.

Fig. I shows the pelvis of a hydronephrotic kidney lying well down in the left bony pelvis. The ureter was  $3\frac{1}{2}$  to  $4\frac{1}{2}$  inches in length. The pelvis of the kidney was upward and inward from the cortex, and the ureter's course upward and outward then downward and inward. The position of the other kidney and the outline of the pelvis, normal.

The patient was operated on November 18, 1912, by W. J. Mayo. The position of the kidney was found as shown in Fig. I. The pelvis was hydronephrotic and infected; the ureter about 4 inches long. The blood supply to this kidney came from two or three renal arteries from the left common iliac about one-half inch below the division. The renal vein entered the vena cava just at the bifurcation and was closely adherent to the kidney-mass. All of the left external iliac vein could not be found. It may have become fused with the internal or it may have been very small, due to the pressure of the adherent kidney.

Thyroidectomy. Injecting local anesthetic, novocaine, 1 per cent. in skin;  $\frac{1}{4}$  per cent. in deeper structures.



a boy of his age. Hæmatemesis occurred once or twice at the end of an attack of excessive vomiting; he at no time vomited more than a half spoonful of blood. He did not lose much weight, but he was quite weakened. The bowels had been kept regular with cathartics.

*Physical Examination.*—On entering the hospital, May 31, 1912, he had a temperature of 97.4° and a pulse of 90. He was a pale, undersized boy. His hæmoglobin was 70. His heart and lungs showed no evidence of disease. His urine contained no albumin or sugar. A visible palpable tumor apparently the size of an orange presented in the upper portion of the abdomen above the umbilicus and in the midline. It was not tender.

June 1, 1912. Laparotomy was performed. The tumor was a smooth soft mass extending from the pylorus 8 cm. over the anterior and posterior walls and projecting into the lumen of the stomach. No enlarged lymphatics were felt. On account of the age and condition of the patient a two-stage operation was considered advisable. Gastro-enterostomy was done at this time and the patient's physician was told to return with him in from three to six months for excision of the mass.

The patient made an uneventful recovery from the first operation and seemed perfectly well for two months. He then had several attacks of vomiting at intervals of about a month which weakened him considerably, but at the time of his second entrance to the hospital on February 1, 1913, he appeared in fair physical condition. There was a small chain of palpable inguinal lymphatics on both sides not noticed in the previous history. On February 4, 1913, the abdomen was again opened. The tumor had apparently not increased in size. No glands were felt in the region of the lesser or greater curvature. Gastrectomy was performed; it was necessary to remove about one-third of the stomach in order to encompass the mass, which was excised. The patient again made an excellent recovery. He was discharged from the hospital two and a half weeks later in good condition. His temperature and pulse were normal. He was eating six small meals a day. Since then his progress has been very good. Two months after the operation he had gained twelve pounds in weight.

*Macroscopic Appearance of the Tumor.*—The tumor was 8 cm. in length by 6 cm. in thickness. It weighed 341 gms. It exactly occupied the site of the pylorus, extending for half its length along the greater

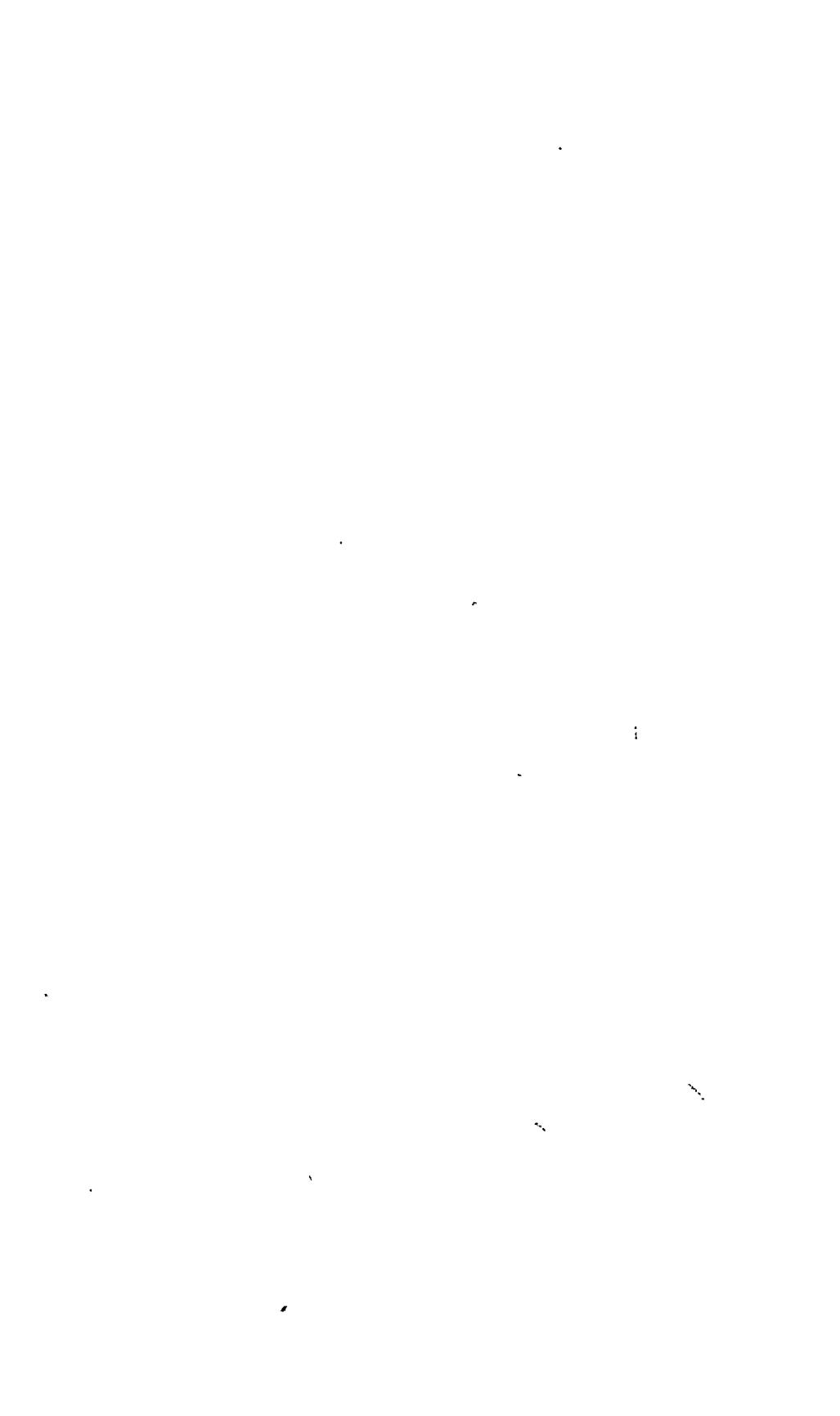


FIG. 1.



Appearance of the tumor, with pylorus cut across; the mucosa is above.

FIG. 2.



Section of the mass.

methods of local anaesthesia and anæsthetic association will exert a beneficial effect, by diminishing the nerve strain and shock of patients both during and before operation.

The same purpose is served by proper preliminary medication, and by the personal contact of surgeon with patient, confidence which results in a state of nerve-calm.

The possible disadvantages of local anaesthesia, in a small number of cases, consist in the added difficulty and length of the surgical procedure, the increased demands upon the operator's skill and self-possession, and the intractability or hysterical condition of certain patients. Other objections, such as an unfavorable influence of the local injection upon the repair process, are not tenable.

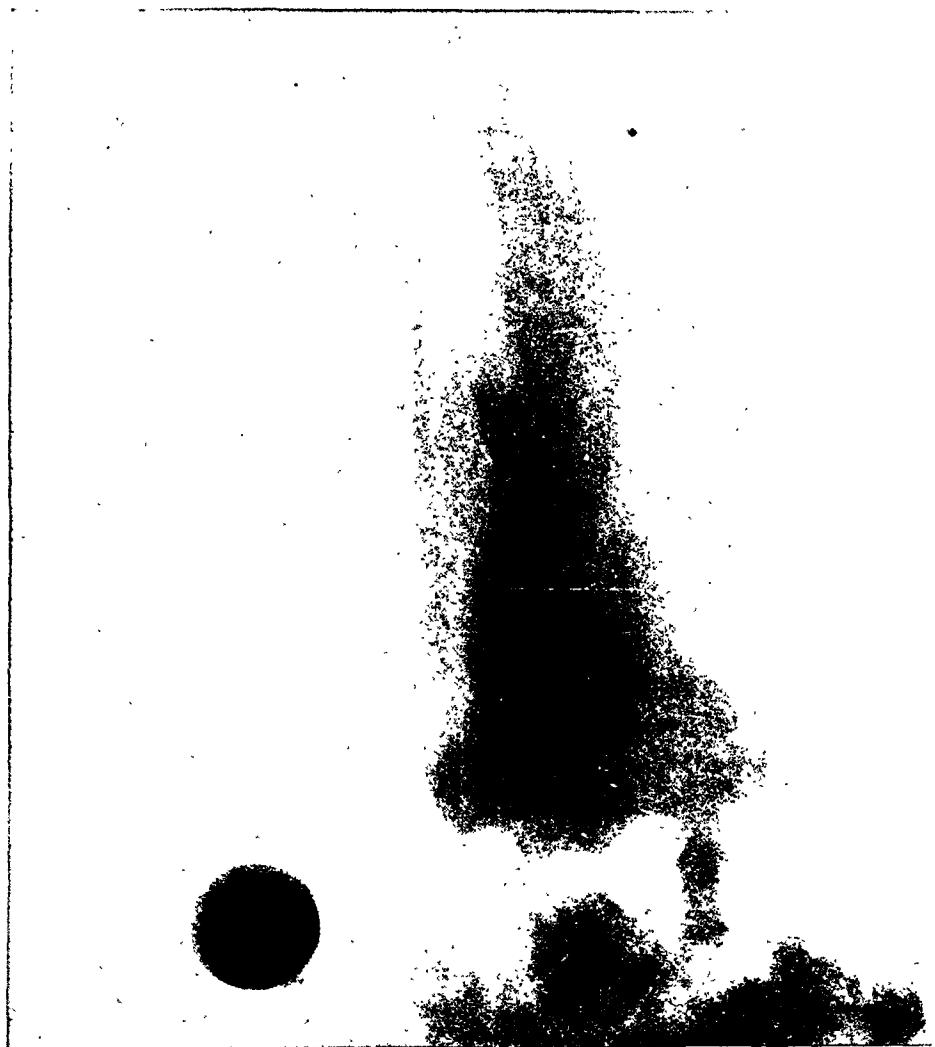
Goitre must be regarded as a surgical disease, and operative intervention naturally calls for the control of pain. The physician who has the comfort and safety of his patients at heart will give them the utmost benefit of what is, perhaps, the greatest blessing modern chemistry has bestowed, namely, the arbitrary arrest of pain in the field of operation, by means of local anaesthesia.

Any of the local analgesic agents may be employed—stovaine, cocaine, novocaine, etc. In the case illustrated here-with, novocaine was employed, 1 per cent. in skin, and  $\frac{1}{4}$  per cent. in the deeper structure. The case was one of exophthalmic goitre, with large vascular thyroid, and with marked heart and eye symptoms. Preliminary medication of  $\frac{1}{4}$  of morphine, and  $1/150$  of atropin, is given half an hour before operation.

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FIG. 5.



Study of the stomach with bismuth meal.

out my statements regarding "stovaine." Given a certain surgical case having undergone operation and a post-operative death occurring, the convict body to a man would claim that the stovaine was responsible, and, as a direct result, surgical procedure would be looked upon with a most pronounced degree of doubt by the convicts. As no post-anæsthetic death has ever occurred, and as the results have been so uniformly successful, we are often confronted with complaints to the Warden that we are negligent, and, in fact, it is not an unusual thing to have a convict urgently insist upon an operation.

To one versed in prison medicine the foregoing carries a potential story. It tells that the fear of surgery has been removed from the minds of probably the most skeptical, superstitious and doubting class on earth, namely, the convict body of a large prison. The reason for the assumption of this attitude is due, not to superlative surgical skill or wonderful nursing, but in fact to stovaine analgesia. The fact that its use was instituted simply as an expedient, due to the lack of proper assistants, who would be able to administer ether, and the fact that to-day its continued use has become a routine, indicates undoubtedly its value.

By many surgeons the use of stovaine has been sharply criticized,—it has been termed dangerous—it has been stated that its field of usefulness is too limited, and many other objections raised to its employment. I do not seek to deny that its use is always unattended by danger, surely in a case in which other agents are strongly contra-indicated the use of any anæsthetic would be attended with a certain degree of risk and this is true of stovaine when employed in depressed physical conditions. When employed in a routine method, the fatality record will be practically negative. It has been my experience that the surgeon who condemns stovaine will admit that in cases of cardiac and renal disease where the use of ether is hopeless, spinal analgesia may be considered, as there will probably be less danger of a death occurring. This reasoning appears to me rather illogical for surely if stovaine is a relatively safe, or rather less dangerous agent than ether, in cases with grave, <sup>1</sup> ions,

Rupprecht<sup>10</sup> performed gastrectomy on a male aged fifty-two for a myoma weighing 251 grammes. Von Erlach<sup>11</sup> removed a stomach in a woman, thirty-four, with a leiomyoma weighing 5400 gms. The patient recovered.

Von Eiselberg<sup>12</sup> excised a fibromyoma of the stomach in a woman aged thirty who recovered. Nicoladoni<sup>13</sup> reported a fibromyoma in a man aged sixty.

Herhold<sup>14</sup> had a patient, female aged thirty-seven, who was operated on for persistent vomiting. She had a myoma at the pylorus the size of a hazel-nut. Bland-Sutton<sup>15</sup> reports a pure myoma found on the posterior wall of the stomach during an operation for gall-stones. Poirier<sup>16</sup> reports a cherry-sized myoma at the pylorus in a woman fifty-eight. Sainter<sup>17</sup> had a female patient forty-nine years of age who complained of nausea and emaciation. She had no palpable tumor but at operation a myoma was found at the pylorus: gastro-enterostomy resulted in recovery. Delore's<sup>18</sup> patient had a palpable tumor, a leiomyoma; he died two years after a gastro-enterostomy. Gouillioud's<sup>19</sup> patient was a male aged forty-four who had a tumor in the right hypochondrium. It proved to be at the pylorus. Pylorectomy and gastro-enterostomy were done. The patient was well six months later. Histologically the tumor was a leiomyoma. Ochsner's case reported by Yates<sup>20</sup> was a male aged seventy-three who was operated on for distress in the epigastrium. There was no palpable tumor. A tumor the size of a walnut was removed from the posterior stomach wall. It proved to be a myoma. Cholecystectomy was also done. The patient was well one year later.

Goebel's<sup>21</sup> case was a woman sixty-nine years old who suffered from an abdominal tumor and emaciation; a leiomyoma of the anterior wall of the stomach was removed. The patient died.

Thompson's<sup>6</sup> case was a woman aged forty-two. Four years after operation she vomited blood and passed tarry stools. She fainted many times during the four years and always passed tarry stools for days after a fainting spell. Later she suffered from pain in the epigastrium and emaciation. There was no palpable tumor. Operation revealed a large tumor growing from the posterior wall of the stomach. Partial gastrectomy and gastro-enterostomy were done. The patient was well six months later and had gained thirty-five pounds.

Hake<sup>22</sup> added three cases found in autopsy material; all small annular myomata at the cardia. Ferguson<sup>23</sup> catalogues a myoma of unusual size at the cardia. Shuyeninoff<sup>24</sup> reports two cases of malignant leiomyoma of the stomach. Battey<sup>25</sup> reports one case in a woman sixty-five years old; a diagnostic puzzle which proved at autopsy to be a suppurative leiomyoma of the cardia. Foulerton<sup>26</sup> describes a specimen removed by Bland-Sutton<sup>15</sup> evidently the same as described by him in a separate article. Spencer<sup>27</sup> reports a case in a woman aged forty-six who had a large submucous tumor which proved to be a fibromyoma. He mentions in his paper another case operated upon by another surgeon:

fore operation is not so marked. Then, too, during the operation a line may be obtained on the patient's condition by his expression of state of feeling.

*b.* Perfect analgesia. If spinal tap has been successfully performed, and a free flow of fluid results stovaine gives a perfect analgesia.

*c.* Absence of post-operative shock. Immediately upon completion of operation a quarter of morphine is given hypodermically. This practically controls post-operative shock, and delays return of painful sensibility, so that with its reappearance a goodly degree of toleration has been established.

*d.* Absence of post-operative pulmonary or bronchial irritation. In contradistinction to ether or chloroform there is no elimination of vapor from the pulmonary or bronchial membrane, hence, no factor to cause any inflammatory condition of these structures.

*e.* Recovery from anæsthesia unattended by stomachic disturbances, as vomiting, retching, etc. Any nausea or vomiting is secondary to the "absorption reaction," is more or less reflex in character, and quite disappears before patient leaves the table.

*f.* Absence of marked motor restlessness as is present in ether anæsthesia when patient is emerging from anæsthesia. This is due to the fact that stovaine is properly an analgesic agent and consciousness has been retained.

*g.* Immediate resumption of gastro-intestinal activity. Subsequent to inhalation anæsthesia there is a period of 48 to 72 hours before the stomach will functionate properly, due to the irritation occasioned by and the absorption of ingested ether vapor. The inability to assimilate nourishment occasions a physical depression and causes a nutritional loss that naturally prolongs period of convalescence. Following stovaine analgesia nutriment is commenced eight or ten hours subsequent to operation and diet rapidly increased. This insures a more rapid convalescence.

*h.* Absence of after effects. The only case developing a nervous lesion subsequent to operation was that of a prisoner

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deep as usual and passed rapidly. I attributed it to the fact that needle carried a minute quantity of iodine with it and it affected the solution.

*Outfit and Technic.*—The syringe used is the Kny Scheerer Co.'s model of the Bier syringe for spinal anæsthesia. It consists of a glass barrel and metal plunger, and has a capacity of 2 c.c., the needles, two in number and 8 cm. long, are steel with bevelled points. The point of the obturator is bevelled to the same slight angle as the needle point, so that when it is in position within the needle, the needle point is solid. The needle presents a double shoulder, which is flattened on either side and which affords a firm grasp. The shoulder also presents a ground bevelled opening, which receives the tip of the syringe.

The syringe and both needles are wrapped in gauze and boiled in distilled water for fifteen minutes. Formerly a soda solution was used and an occasional defective analgesia occurred, notwithstanding the fact that syringe and needles had been most carefully rinsed and cleaned in hot sterile water.

The syringe is inserted into one of the needles and the contents of ampoule carefully drawn up. The needle is now discarded, syringe held tip up and excess of solution over desired dosage is permitted to escape. Syringe is carefully laid on a sterile towel on dressing table and the other needle used to make puncture.

Patient sits squarely on table with the legs hanging over the side. Head is bent downward on chest, arms to sides and forearms crossed over lower abdomen and resting on thighs. This arches the spine slightly forward and permits entrance of needle in desired interspace. The iliac line represents spine of the fourth vertebra. With this landmark the desired space is noted.

Usually I inject in the space between the second and third, third and fourth or fourth and fifth, choosing the interspace that presents the widest separation. After deciding on point of puncture, assistant sprays it with ethyl chloride and then with the left thumb, as a guide, on the vertebra above the interspace, the needle in the right hand is made to enter the skin at right angles about the middle of the interspace and a quarter of an

cases reported by Nothnagel, 2 by Frank and 3 by Baillet, making 32 in all up to June, 1911, which is the last report I can find.

A. Baer<sup>7</sup> found 10 sarcomas in 124 inflammatory tumors of the ileoçæcal region.

*Pathology—Microscopic.*—Whereas all varieties are found, the most frequent type is the round cell; and perhaps the lymphosarcoma is second in frequency.

Jopson and White report only one spindle-cell tumor in the twenty cases where the type was known.

The tumor probably usually begins in the submucosa, and may be pedunculated, or may infiltrate the bowel wall, causing great thickening; but does not often involve the serosa. Tendency to stenosis is not marked; and, indeed, dilatation may occur. The growth has a tendency to develop longitudinally in the bowel wall, and has not the predilection for points of irritation which is so often manifest in carcinoma. The abdominal lymphatics are apt to be involved early and extensively, and metastasis here is most frequent. Perhaps the peritoneum is next. The actual diagnosis cannot be made except with a microscope.

*Incidence of Sarcoma as Compared with Carcinoma.*—These growths, while having much in common clinically, have many distinguishing features which are unlike; but a classification of symptoms which might point to more than a probable diagnosis is impossible.

Generally speaking, sarcoma appears in younger individuals, grows more rapidly, and is more apt to show tumor. Wasting and anaemia are more marked, and pain is out of proportion to obstructive symptoms. Early cachexia and less liability to stenosis and to hemorrhage, and perhaps irregular fever are the most distinguishing features of sarcoma.

*Treatment.*—Excision offers the only hope. Glandular involvement is no contra-indication. So far results have been discouraging.

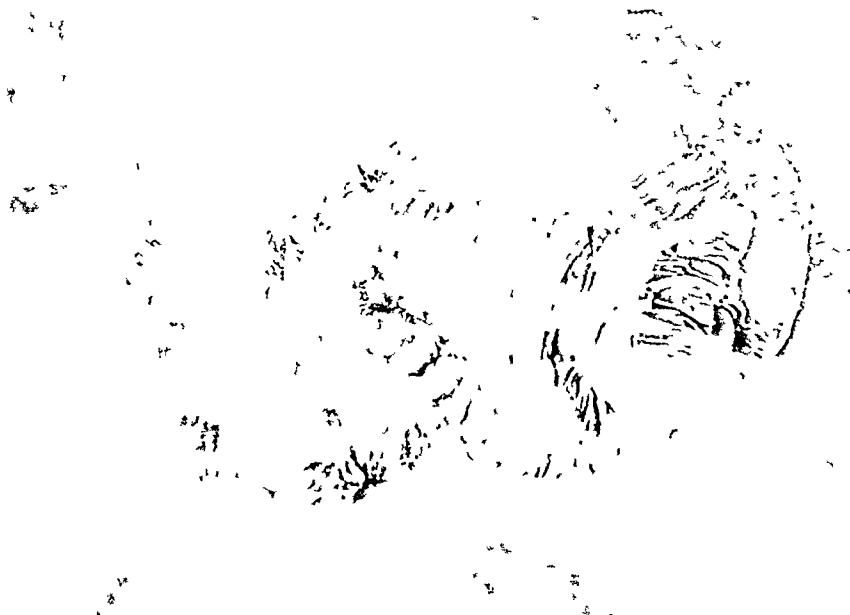
Corner and Fairbanks' statistics show a mortality of 33 per cent. in 51 resections. Of 11 resections in the large intestine, 7 survived the operation. Fourteen of 22 cases

canal. Usually analgesia to border of ribs appears within the two minutes. After the injection analgesia usually presents in from five minutes up to fifteen and lasts from three-quarters of an hour up to two hours. The solution employed is the Kroenig formula of "stovaine-billon." It is a 4 per cent. solution of stovaine in 10 per cent. solution of sodium chloride and is sealed in ampoules of 2 c.c. The ampoules are easily rendered aseptic by rinsing in alcohol, they are easy to handle and the solution is apparently a stable one. The billon ampoules have been used exclusively on account of their convenience and also because it has seemed inadvisable to attempt the preparation and handling of a freshly made solution in the surroundings. We have never had any infection of the canal, cord, or adjacent structures following the use of stovaine. The dosage varies according to the case. Eight or ten minimis suffice in the slight operations upon the external genitals. In appendectomy and herniotomy a heavier dose is employed. I have at times used 25 drops. The comparatively large dosage has been used as I never administer a primary dose of morphine.

In the cases that present a well-marked "absorption reaction" there is nausea and infrequently vomiting. Some epigastric pain is complained of but these symptoms rapidly pass. Usually a few teaspoonfuls of water or a few drops of aromatic spirits of ammonia well diluted controls the condition if it appears to persist. The one great danger is that of respiratory depression and paralysis. This condition is secondary to the extension and absorption of stovaine high up the spinal canal. In one case, 55 years of age, herniotomy, this was well marked. Head was elevated and strychnine administered hypodermically. Condition passed off in about five minutes without the necessity of resorting to artificial respiration. In this case I feel that a definite idiosyncrasy was present.

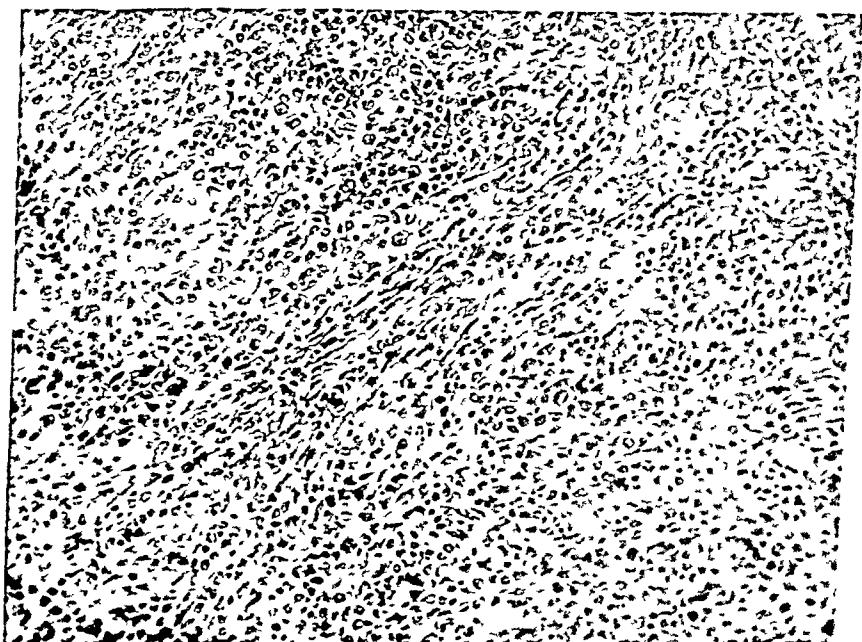
The after-treatment of stovaine analgesia is practically negative. A hypodermic of morphine as has been previously stated is administered at completion of operation. This lessens the post-operative shock as pain sensibility is regained. In occasional cases, severe headache is encountered. This is best

FIG. 1.



Photograph of gross specimen sectioned longitudinally. The sharp limitations of tumor, the nodular projecting masses, the thickened walls and the absence of ulcer are the prominent features.

FIG. 2.



Microphotograph, times 500. See [www.ncbi.nlm.nih.gov/pmc/articles/PMC131331/](http://www.ncbi.nlm.nih.gov/pmc/articles/PMC131331/)

## MEDICOLEGAL ASPECTS OF ANÆSTHESIA.\*

BY F. HOEFFER McMECHAN, M.D.,  
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WHILE the anaesthetist is bound by those rules which govern the professional conduct of all registered or licensed practitioners, still, in many respects, his position is ill defined and subject to modifying circumstances. This is due to the fact that only during the last few decades has the anaesthetist been acquiring some independence, and consequently only a limited number of legal decisions are available for his guidance. These medicolegal aspects of anaesthesia, however, are of sufficient importance to demand conscientious consideration from those who are making anaesthesia a "specialty."

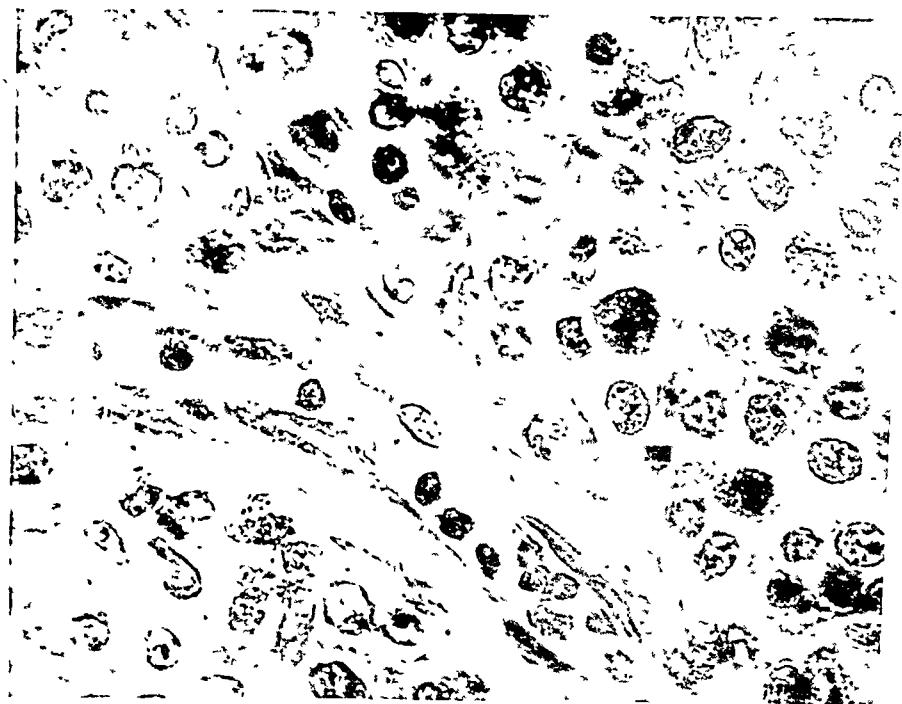
In the ordinary routine of his work the first legal obstacle that confronts the anaesthetist is the question of consent.

*Consent.*—No person can be legally anaesthetized without consent, unless the anaesthetist opens himself to a charge of assault. In the case of children and the insane, consent must be secured from parents, guardians or those legally authorized to give it.

Commenting on this subject,<sup>1</sup> it is held in England that the power of a parent to withhold consent, even to a necessary operation, is absolute. On the contrary, Judge Leuders, of the Hamilton County Probate Court, Cincinnati, O., recently removed a child from the guardianship of an aunt, who was having her treated by a "faith curist," to the custody of a grandmother, who promised to place the child under proper medical treatment for the contagious disease from which it was suffering. It is probable that a similar jurisdiction would be exercised by the Juvenile Courts, should their medical officers or outside physicians appeal from parental non-consent to anaesthesia or operative procedures, especially in cases of urgency, when the life of the child was involved.

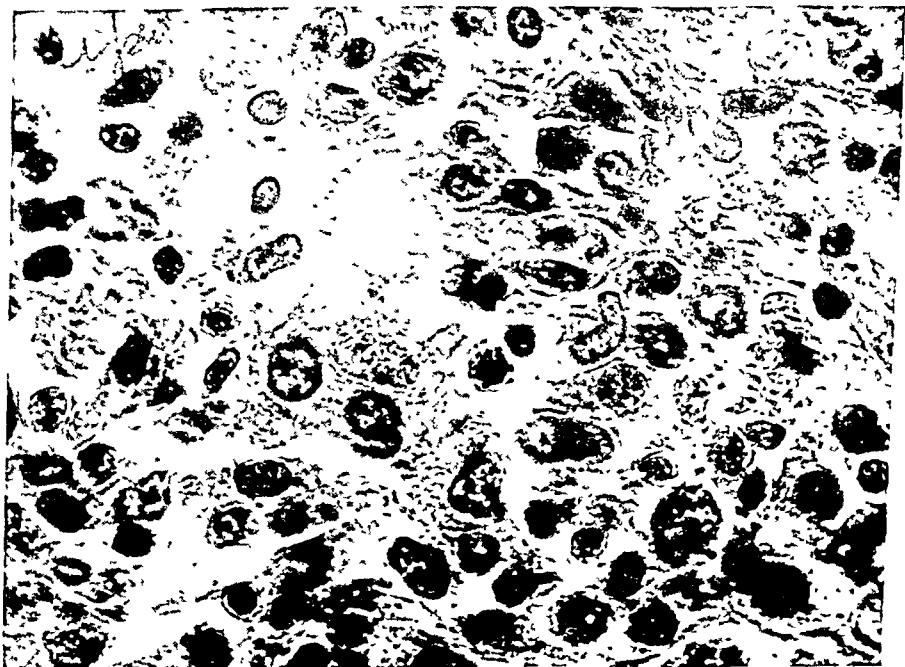
\* Read before the American Association of Anæsthetists, June 18, 1913.  
<sup>1</sup> Lancet, May 6, 1911, p. 218.

FIG. 5.



Micropograph, times 900. Enlarged view of thin-walled capillary with surrounding tumor cells, some of which show mitotic figures.

FIG. 6.



Micropograph, times 1000. Showing characteristic arrangement of tumor cells which have vesicular nuclei of irregular size, shape and staining reactions. The fine inter-cellular fibrillæ are represented in upper right hand corner.

ordeal, until during the induction of anæsthesia with chloroform by the drop-method, when she used a woman's prerogative and abruptly changed her mind. She sat up on the operating-table, and demanded to be returned to her room, unoperated. Persuasion was found to be useless and she was accommodated in her desires, all the medical men interested, washing their hands of the case. It is the unexpected that occasionally happens. To have attempted forcible induction of anæsthesia under the circumstances could easily have led to the preferment of a charge of assault, and in case of an anæsthetic fatality, there would have been additional grounds for a prosecution of manslaughter.

The anæsthetist may also be placed in a rather embarrassing position should the operating surgeon find it impossible to keep within the limitations of the operation to which consent had been given; and not only modify the intended operation, but perhaps attempt to substitute an entirely different one, of which the patient or relatives may afterward disapprove, or which of itself may inject the important element of fatality into the procedure. Under certain operative circumstances the anæsthetist would find it impossible to withdraw without jeopardizing the patient's life, and he can only protect himself by entering a protest against the procedure, while at the same time he bends his every effort toward a fortuitous outcome. The case of *Lawson v. Crane & Hall* has an indirect bearing on this point.<sup>3</sup>

The lower courts of Vermont had awarded a judgment for damages in favor of the plaintiff. During the trial, however, testimony of the defendant, that he had protested against the contemplated operative procedure, although he had later administered the anæsthetic during its performance, was excluded. On appeal the Supreme Court held that: as the defendant had already advised against any operation at the time and place it was performed, but his advice had been disregarded, and the operation had been performed contrary thereto, and was not subject to his control, he having only administered the anæsthetic in the capa-

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<sup>3</sup> Supreme Court, 74 Atl. R. 641, Jour. A.M.A.



Thyroidectomy under local anaesthesia. Goitre exposed and tumor dislocated from behind sternum and brought up into wound.

to undergo an operation. His honor, Judge Scully, held that: the plaintiff's objection to an operation on account of the coincident danger of the anæsthetic was not unreasonable and made an award of compensatory weekly indemnity.

Similar cases are bound to arise in the adjudication of Workmen's Compensation Laws in this country, and as several fatalities under anæsthesia have already occurred in England, to persons submitting to operation under the requirements of the law, any individual case in which there is grave danger from the anæsthetic should be carefully considered, before consent to an operative procedure is legally demanded.

The question of consent to an examination under an anæsthetic in connection with a military pension, was brought before Parliament, in 1907, by Mr. Wedgewood Bain. It appears that a soldier named Craig had been required by the War Office to undergo an examination under an anæsthetic before the continuation of his pension would be granted. Mr. Haldane, answering for the War Office, stated that an anæsthetic would not be administered unless it was considered safe by the medical authorities, and the latter would be glad to receive any evidence that Craig was unfit to submit to general anæsthesia; but the ultimate decision as to whether he was or was not fit must rest with the medical examiners of the War Office. In the event of death under the anæsthetic the man's dependents would have no claim to compensation against the government.<sup>5</sup>

Mr. Haldane's last remarks have since been abrogated by several decisions under the Workmen's Compensation Law, which will be quoted at length later on.

It must also be remembered that in the employment of untried anæsthetic agents or in initiating newer methods of administration, a grave responsibility rests with the anæsthetist, unless the patient is fully advised of the experimental character and possible untoward results of the procedure, and his consent to the trial has been previously obtained.

<sup>5</sup> British Medical Jour., vol. i, 1907, p. 1327.

In discussing the goitre operations of the five years between 1905 and 1910, in the Surgical Clinics of the Berlin Charity Hospital, Walz accords the preference to local anaesthesia. There was only one death among 120 benign goitre cases. In the experience of Enderlen, local anaesthesia failed in only a single instance, in the case of a child, among 166 goitre operations, during 1909. In the Clinics of Rehn, in Frankfort-on-the-Main, the preference is accorded to local anaesthesia in these cases. In reporting 510 and 452 goitre operations, respectively, from the Innsbruck Surgical Clinics, 1909-1910, Schloffer states that local anaesthesia with different agents proved very satisfactory. Fairlie Clarke, in England, had very favorable results with local anaesthesia in goitre operations, such as excision of one-half of the gland or ligation of both superior thyroid arteries.

As a pupil of Kocher I have been interested in local anaesthesia in goitre surgery, and added experience has steadily strengthened my convictions concerning the expediency of this method.

Manipulations on the goitre are said to be but slightly painful in themselves, the actually painful steps of the operation being limited to the incision of the skin, and the displacement, or so-called luxation, of the goitre. It is undoubtedly possible to operate painlessly, or very nearly so, in a large number of cases, by means of local anaesthesia. The skin incision is thus rendered absolutely painless, and in the further course of the operation, the patient is troubled not so much by pain, as by a sensation of tightness and pressure, during the delivery of the goitre. Serious and protracted goitre operations have been performed under Schleich's infiltration anaesthesia, without causing special pain to the patient.

The employment of local anaesthesia may place a greater strain upon the operator, whose work may be hindered by the defensive movements of the patient, on account of the pain due to traction upon the nerves or the application of ligatures to blood-vessels. It is here that combination of the related

5. Students would be permitted to administer anaesthetics only after instruction and then only under proper supervision.

6. Finally the chemical purity and non-deterioration of the anaesthetic agents would have to be determined before use.<sup>6</sup>

Certainly a set of regulations worthy of the highest commendation and the most widespread promulgation on the part of the Health Departments of our various states and larger cities, particularly in those medical institutions within their immediate control.

At its Dublin meeting, November 10, 1910, the Royal Academy of Medicine discussed proposed legislation regarding the administration of anaesthetics, and the resolutions passed are embodied in a Bill, which the Society of Anaesthetists, London, under the leadership of Sir Frederic Hewitt, is attempting to pass through parliament.

The general provisions of this bill are as follows:

1. That it is advisable in the public interest that the administration of general anaesthetics to render persons unconscious during any medical, surgical, obstetrical or dental operation or procedure, should be restricted by law to registered medical practitioners, with this exception, that the specification of the anaesthetic drugs which may be employed by registered dental practitioners during dental operations or procedures, should be made in a schedule, power being reserved to the Privy Council on the recommendation of the British Pharmacopœia to add to or vary the specified list from time to time as occasion may require.

2. That provision should be made for the instruction of medical and dental students in the administration of anaesthetics.

3. That the administration of local analgesics for producing insensibility to pain during any surgical or dental operation or procedure, by the introduction beneath the skin or mucous membrane of any fluid or other substance by a hypodermic needle or in any other way, should be restricted by law to

<sup>6</sup> British Medical Jour., August 21, 1909, p. 496.

## STOVAINE SPINAL ANALGESIA IN PRISON SURGERY.\*

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THE use of stovaine as an anæsthetic agent at the Sing Sing Prison hospital dates back to 1908 when Dr. Fred E. Lettice, the then Prison Physician, encountered a situation which endures in the prison system of New York State, namely, the utilization of convict help to that extent that even in the various prison hospitals no civilians are employed. This system, while most creditable to the general prison administration, works rather against the surgical operator, as the absence of trained assistants is a serious handicap. Dr. Lettice not caring to assume the responsibility of the oversight of a convict administering ether was led to experiment with stovaine. An idea as to how well he succeeded may be gained from the fact that to-day no operation upon the body below the level of the umbilicus is performed under any other anæsthetic agent than stovaine. The results in the past five years have been particularly brilliant.

The practice of medicine in penal institutions is, naturally enough, similar to other institutional medical practice. Yet, in no variety of institutions is the degree of superstition of the inmates as marked. The old bugaboo of the "black bottle" still holds sway. The malingerers and the members of the new generation are the ones that continually present on sick call. Let a death occur in one of the wards and invariably a number of the patients in that ward speedily recover and request to be discharged. This in illustration of the fear of the hospital held by the great majority of the prisoners.

The foregoing facts are simply mentioned to call attention to the psychological side of prison medicine and also to bear

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\* Read before the American Association of Anesthesiologists, June 18, 1911.

public institution or a private house, should be reported to the coroner. If the coroner on due inquiry is satisfied that all due care and skill have been used, we think it is undesirable that there should be an inquest.

R. Henslowe Wellington, an English coroner of broad experience, in writing upon coroner's law, deplores the undesirable tendency to cause alarm in the minds of the public by sensational reports of inquests on deaths under anaesthesia.<sup>9</sup>

On the contrary, Dr. Waldo, Coroner for the City of London and Southwark, advocates inquests in all anaesthetic fatalities. Also he holds that the legal responsibility for the casualty rests with the person by whom the operation is controlled, that is, by the surgeon. He maintains that if the operator can be justly accused of selecting an assistant, who had not had sufficient experience to enable him to give the anaesthetic properly, and was himself so engaged in the operation as to be unable to personally supervise the administration, then in case of accident the surgeon can be held liable under the law, and in case of a charge of malpractice or a verdict of culpable neglect by a jury, it might become the duty of a coroner to commit the operator, not the anaesthetist, for manslaughter; except in cases where the anaesthetist happened to be in an unfit condition at the time or showed gross carelessness.<sup>10</sup>

Commenting on this matter the Law Journal says :

Where patients submit to or are subjected to operations which require or are better done under anaesthetics, they and those whose subscriptions maintain the hospital are entitled to some guarantee that the utmost skill and care shall be used, and it is well that an inquiry has been instituted with reference to the very frequent deaths in hospitals under anaesthetics, for it is not desirable to have these matters decided by a prosecution of doctors for malpractice or manslaughter.

In a discussion at the meeting of the Medicolegal Society, London, April 27, 1909, regarding the relative responsibility of surgeon and anaesthetist, Mr. Cowburn stated that he could find no recorded case in English law in which either criminal or successful civil action had been brought against a medical

<sup>9</sup> Lancet, October 8, 1910.

<sup>10</sup> British Medical Jour., January 4, 1908.

why should it not be more than relatively safe when used in the ordinary routine of surgical practice, and upon cases uncomplicated by some chronic affection. The surgeon, by assuming this attitude, has, therefore, sharply limited the field of usefulness himself, by only utilizing this agent in cases depressed by organic disease. That the field of usefulness is limited is true, yet, nevertheless, from a surgical stand-point, any agent that produces a satisfactory and complete analgesia, which permits surgical procedure below the level of the umbilicus, possesses a rather broad field of application. I have never experimented in producing a high analgesia, but rather have contented myself in trying to improve and safeguard the lower administration of stovaine.

The advantages of the use of this form of analgesia would seem to outweigh the disadvantages.

The disadvantages are:

*a.* Inability to change the dosage after once being administered. Yet, in cases where stovaine absorption has caused a marked depression this can be controlled by altering position of patient and the hypodermatic administration of strychnine.

*b.* In prolonged operations there is the possibility of the effects of the stovaine passing. I have been confronted with this situation but twice, and in both instances the wound was being closed, pain being complained of as suture needle passed through the skin. This condition was readily controlled by a hypodermic of morphine. Against the possibility of analgesic effects wearing off before completion of operation, I wish to call attention to a case of large rectal prolapse. Time of operation in excision was 95 minutes, analgesia was perfect for that time and lasted for 35 minutes more.

Against the disadvantages as enumerated, we have the following advantages:

*a. Consciousness.*—W  
is a distinct advantage in  
patient's knowledge that he  
but will remain perfectly con-  
forted, and the attitude

rather than to the anæsthetic. In these days of specialism anæsthetization can no longer be considered merely a part of the surgical procedure.

Mortimer suggests that in becoming a "specialist," the anæsthetist opens himself to actions for damages on account of injuries sustained during anæsthetization; for example, the breaking off of a tooth from forcibly opening the mouth; injuries sustained during struggling; bruising of the tongue; accidents or failures such as loss of an eye from a movement of the head or inability of the surgeon to complete an operation, or such after-effects as brachial paralysis, burns from hot water bottles, etc. While there is considerable speculation in the foregoing, still the anæsthetist through carelessness may readily bring a damage suit down upon the head of the operating surgeon or the trustees of his hospital.

There is a case quoted in the American Encl. Digest in which, in a Western hospital, after a patient had been successfully operated, he was carelessly dumped down an elevator shaft while being returned to bed. In this case, the patient still being under the influence of the anæsthetic, the operating surgeon was mulcted of heavy damages.

There is a suit pending in the Hamilton Co. Courts, Cincinnati, against the German Deaconess Hospital, for burns sustained by hot-water bottles, while the patient was still under the influence of the anæsthetic, post-operatively. This suit revives interest in that of *Ward v. St. Vincent's Hospital*, in which the Supreme Court of New York, by the opinion of Judge Gildersleeve, reversing the lower courts, on retrial, gave a verdict of \$10,000 damages to the plaintiff for breach of contract due to injuries resulting from burns by a hot-water bottle, while under the influence of ether after an operation. In the lower courts the judge had directed a verdict for the defendant on the ground that the hospital was a charitable institution and therefore not liable for the negligence of employees. On appeal it was proven that the plaintiff was a pay patient, and hence the verdict for damages on the grounds of alleged breach of contract.

In the case of *Hillyer v. Governors of St. Bartholomew's Hospital*, for alleged burns and brachial paralysis sustained during an examination under an anæsthetic, Justice Graham took the case from the jury on the grounds that the plaintiff had not proven negligence, and gave a verdict in favor of the defendants. On appeal, Lord Justice Farwell, said with regard to the question of liability that: surgeons and anæsthetists are not under the direction of hospital governors or bound to obey their orders, and therefore cannot be regarded as being their servants, for whose acts they would be liable. The governors were only subject to use-care and skill.

- . fifty-nine years of age, who suffered an attack of apoplexy with resultant hemiplegia four months subsequent to operation for hernia, in which stovaine analgesia had been employed. The prisoner's father and uncle had died of apoplexy, prisoner himself presented a well-marked arterial thickening, gave a history of alcohol, and was the father of nineteen children. The chance that stovaine was the cause of attack in this case would seem to be rather remote. In another case, a prisoner forty-four years of age with a left hemiplegia was operated upon for an inguinal hernia under stovaine with no untoward after-effects.

I will now describe briefly the procedure I follow:

The general preparation of patient for stovaine analgesia does not require much attention. Cases admitted to the hospital for operation on the following day receive soft diet and a dose of magnesium sulphate at bed time. In the morning if the bowels have not moved a soapsuds enema is given. A couple of hours before operation is to begin patient receives a glass of milk and one toasted cracker. It has been observed that if a small amount of food, as described, is given, there is less likelihood of nausea or vomiting after stovaine has been injected.

In a number of emergency cases stovaine has been administered immediately upon patient's reception to hospital without regard as to condition of the gastro-intestinal tract. In these cases it has been well borne, although it is quite usual for the bowels and bladder to involuntarily empty while patient is on the table, due to the stovaine relaxation of the sphincters.

In the *special* preparation for the injection the back is thoroughly scrubbed with tincture of green soap and lower half is shaved. By means of hot water and hot packs all soap is removed and back rinsed in absolute alcohol. A pad about 6 inches square and saturated with alcohol is placed over spinal region at site of injection and held in place by a bandage. This is permitted to remain fifteen or twenty minutes and is not removed until patient is on table in position to receive injection. In the single instance I used iodine the analgesia was not as

inch to either side of the midline. It is carried directly forward until it engages the yellow ligament which imparts a definite resistance to the feel. Needle is now advanced further forward, slowly and cautiously until it punctures the dura. As it penetrates the dura the sensation is about the same as would be given by piercing a drum head with a sharp pointed surgical needle. The obturator is now withdrawn and a free flow of cerebrospinal fluid presents. The obturator is replaced, operator rinses hands in sterile water and then again removes obturator. This time the left thumb is placed over the head of the needle. If an amount of fluid approximating two or three drachms has escaped, the syringe containing the dose of stovaine is placed within the reach of the right hand which carefully adjusts it securely to the needle. The plunger of the syringe is now slowly drawn back siphoning out enough fluid to fill syringe and make a solution of stovaine and cerebrospinal fluid. When syringe is filled to capacity plunger is slowly carried forward and the mixed solution instilled within the spinal canal. Upon occasion I have varied this procedure by removing the filled syringe and by slight agitation thoroughly mixing fluid and stovaine. This method seems to work especially well. While the appearance of the analgesia is somewhat more delayed there is undoubtedly less absorption reaction and analgesia when established is satisfactory. After solution has been injected the needle with syringe attached is gently removed. A small piece of adhesive plaster is placed over puncture wound. Patient is permitted to remain in an upright position for two or three minutes and then carefully lowered onto table and a firm pillow placed under head. This method is followed because the solution used is heavier than spinal fluid solution. If the operative measures are directed toward the perineum, rectum, external genitals or extremities there is no departure from this procedure. However, should operation necessitate opening the peritoneum the hips are elevated for a couple of minutes by means of blocks placed under the legs at the foot of the table. This is to permit the mechanical extension of the stovaine solution higher up the

treated by absolute rest, ice-bag and careful elevation of the head. If persistent, fluidextract ergot in drachm doses usually gives relief.

The following table shows the variety of operations in which stovaine has been successfully employed as an analgesic agent at Sing Sing:

Herniotomy, inguinal, single .....	58
Herniotomy, inguinal, double .....	2
Herniotomy, inguinal, strangulated .....	2
Herniotomy, inguinal, and hydrocele .....	1
Herniotomy, inguinal, and appendectomy .....	1
Herniotomy, inguinal and undescended testicle .....	1
Herniotomy, femoral .....	1
Hemorrhoids, internal and combined .....	15
Fistula in ano .....	16
Appendectomy .....	14
Circumcision .....	14
Varicocele, radical .....	13
Hydrocele, radical .....	9
Hydrocele and varicocele, radical .....	1
Varicose veins, leg .....	2
Prostatectomy .....	2
Urethral fistula .....	1
Urethrotomy, external .....	1
Orchidectomy, tubercular .....	2
Orchidectomy, sarcoma .....	1
Peritonitis, tubercular .....	1
Rectal prolapse, excision .....	1
Inguinal adenitis, excision .....	2
Redundant prepuce, excision .....	1
Exploratory incision .....	1
Compound fracture, both ankles, reduction .....	1
Exostosis, tibia, excision .....	1
Necrosis, tibia, curettage .....	1
Hallux valgus, excision .....	1
Toe, amputation .....	2
Total .....	169

The average age of the prisoners operated upon was from 25 to 30 years. From the foregoing table it will be seen that prison surgery embraces a broad field and the use of an analgesic agent such as stovaine will aid the prison physician decidedly in overcoming the difficulties that beset him in the treatment of surgical cases.

It is also obvious that many young people, particularly among the working-classes, although legally "not of age," are practically independent of their parents. The Canadian Courts<sup>2</sup> furnish a case turning on this point. The patient having agreed to an operation, to which his parents had not consented, the judge's decision was against their protest, on the intrinsic merits of the individual case, rather than upon any fixed principle or newer interpretation of the law.

Actions have been brought for alleged anaesthetization without consent, especially when the patient and anaesthetist have been alone together, and the anaesthetist has also assumed the rôle of operator. The majority of these cases have failed on the grounds that anaesthetization by force was impossible and that there was collateral evidence of consent; but in each instance anaesthetists have been put to the inconvenience of framing a legal defence.

As early as 1867, in *Absolom v. Statham*, Judge Cockburn of England, summing up an action brought against a medical man for forcibly administering chloroform to the plaintiff against her will, for a dental operation, issued this dictum from the bench, that: No surgeon had the right to anaesthetize an individual or perform any operation against the will of a patient, so long as the person preserved consciousness and will, without opening himself to a charge of assault.

Thus, if a patient, who is about to be operated upon, changes his mind during the induction of narcosis, and objects, the anaesthetist must desist from any further efforts at anaesthetization, unless the anaesthetic has so far taken effect that he may reasonably infer that the conscious exercise of judgment has been lost. This seems rather a far-fetched contingency, but a personal experience proves the contrary.

*Illustrative Case.*—Some years ago Dr. Hinckley, surgeon to St. Mary's Hospital, Cincinnati, O., was to operate upon a woman for appendicitis. The patient was apparently resigned to the

<sup>2</sup> J. D. Mortimer: *Anæsthesia and Analgesia*, University of London Press, p. 256.

city of an assistant, therefore he was not called upon to again object to or protest against the said operative procedure, and hence no inference of approval could be drawn against the defendant from his silence in that respect. Therefore judgment for the plaintiff is reversed and his petition dismissed with costs.

The recent passage of Workmen's Compensation Acts by the legislatures of Ohio and California, although the New York Act has been declared unconstitutional, adds a new element of consent to anaesthetization and operation for medicolegal consideration.

In the adjudication of the Workmen's Compensation Act, passed by Parliament in 1906, the English courts have held that an injured employee must submit to any reasonable operative procedure that will lessen his disability. The case of *Bourne v. The Middle-Sussex Water Board* notes an exception to compulsory submission to an operation, if there is danger from the anaesthetic.<sup>4</sup> The following is a brief summary of this important case.

Henry Bourne, laborer, sixty-two, claimed compensation under the Workmen's Compensation Act, before the Haywards Heath County Court, March 18, 1909, for injuries sustained while in the engine room at the Balcombe Water Works, on September 28, 1908, under employment of the Middle-Sussex Water Board. Bourne was called upon to assist in moving a heavy valve, which fell on one of his hands, causing serious injury. He became totally disabled. The employer, on advice of a medical practitioner, suggested that the hand should be operated upon with a view of straightening the fingers; contending that if this was done Bourne would be able to resume his work in the ordinary way.

The plaintiff, however, refused consent to any operation and two medical men gave evidence that an operation was inadvisable as the plaintiff was not a proper subject for an anaesthetic. The respondents contended that this objection was not a reasonable one and asked for the decision of the judge: whether the plaintiff's present condition was not the result of his unreasonable objection

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\* *Lancet*, March 27, 1909, p. 939.

Two very important questions now arise: Who is legally qualified to administer anæsthetics, and what legal regulations regarding the administration of anæsthetics have been promulgated.

The limiting of the administration of anæsthetics to legally qualified practitioners has been presumed in the context of the various state medical practice and license laws, without having been definitely expressed. The nurse-anæsthetist abuse, perpetuated and endorsed by certain surgical clinics, has insidiously crept into the ranks of the profession. There is every promise that this abuse will be speedily abolished by amendments to the medical practice acts or by action of the state societies.

Undoubtedly the opinion of Attorney-General Hogan of Ohio will prevail. He holds that: the use of anæsthetics is a "medical act," and consequently the administration of anæsthetics must be limited to legally qualified practitioners of medicine or dentistry.

There is no Nurse's Bill extant which expressly conveys the legal qualification to administer anæsthetics, and the new Nurse's Bill, now before the Ohio legislature, specifically prohibits the practice. Undoubtedly the agitation of the subject in New York will eventuate in a similar prohibition.

In August, 1909, the Chief of the Board of Health, Vienna, issued to all hospitals and out-patient departments of the Austro-Hungarian Empire, the following regulations regarding the administration of anæsthetics:

1. To have each and every patient especially examined before being put under the influence of any anæsthetic.
2. To limit the use of inhalation anæsthesia to such cases in which this method of narcosis was absolutely necessary. In all other instances local or regional analgesia was to be considered the method of choice.
3. Under no conditions would the same physician be allowed to anæsthetize and operate upon a patient.
4. Legally only qualified medical men would be privileged to administer anæsthetics.

registered medical practitioners, registered dentists, or to persons acting under their immediate supervision, such as students and internes.<sup>7</sup>

So much for the regulation of the administration of anaesthetics under the civil law. The state of New York has gone further, and has incorporated a section in its penal code. This section reads as follows:

Section 1752: A person, other than a duly licensed physician or surgeon engaged in the lawful practice of his profession, who has in his possession any narcotic or anaesthetic substance, compound or preparation, capable of producing stupor or unconsciousness, with intent to administer the same or cause the same to be administered to another, without the latter's consent, unless by direction of a duly licensed physician, is guilty of a felony, punishable by imprisonment in the state prison for not more than ten years.

The occurrences of fatalities or untoward results under anaesthesia bring the anaesthetist before the bar of Coronial inquiry, and leave him open to suits for malpractice or prosecutions for manslaughter. Scotland is perhaps the only country in which no coroner's inquests are held upon "deaths under anaesthesia."

With regard to deaths under anaesthetics the Medicolegal Committee of the British Medical Association, at the annual session in 1910, reported as follows in connection with the law of coroners:

Most coroners hold, it appears, that when a person dies under an anaesthetic given for the purpose of a surgical operation, the death is an unnatural death, within the meaning of Sec. 1 of the Coroner's Act of 1887, and that the coroner is bound to hold an inquest.

Others, however, consider that they have discretion, if after preliminary inquiry they are satisfied that the administration of the anaesthetic was necessary, that it was properly given by a competent person, and that death was due to inevitable accident.<sup>8</sup>

In the public interest we think that the coroner ought to have this discretion. Every case of death under anaesthesia, whether it occurs in a

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<sup>7</sup> British Medical Journal, vol. ii, 1910, p. 1652.

<sup>8</sup> British Medical Jour., vol. i, 1910, p. 826.

man on account of death resulting from or occurring whilst under the influence of a general anæsthetic. Each case had been tried on the facts and the jury's verdict had been given in the light of the attending circumstances.

Mr. Cowburn further submitted that if negligence could be proven in respect of the administration, the medical practitioner actually administering the anæsthetic, was liable, not the surgeon, who was engaged in the operation. If the surgeon, however, took upon himself to decide the particular kind of anæsthetic to be employed, or the technic and apparatus to be used, or the amount of the anæsthetic to be administered, he would be held jointly responsible with the anæsthetist for any unfortunate result to the patient.<sup>11</sup>

But when a nurse or a student was engaged in the administration of an anæsthetic under the direct supervision of a medical man, there then existed the relationship of master and servant, and in the event of any untoward accident the qualified practitioner could be held responsible.

In those cases arising from deaths under anæsthesia, which have come to trial in the English courts on pleas for damages or on prosecutions for manslaughter, the following defence has always proven successful: (1) that the administrator was a qualified medical man, that (2) both the operation and anæsthetic were necessary, that (3) the administration was conducted with the experience and knowledge ordinarily demanded, and that (4) death was unavoidable and not due to carelessness or want of skill.

It would appear for the future that the apportionment of responsibility between the surgeon and anæsthetist, in the event of a casualty, would more or less depend upon whether the anæsthetist was acting merely as an assistant or had been employed as a "specialist". It is gradually becoming the custom for coroners to summon the anæsthetist in cases of inquests for deaths under anæsthesia, and not to summon the surgeon, unless death has been due to some operative accident.

<sup>11</sup> Lancet, May 8, 1909.